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December 27, 1934

Engineering News-Record

ENGINEERING looks back on a time of stress and effort, forward into a time of greater responsibility. Not many periods have seen so much thought given to the engineer's relation to the world he serves as has the one now ending. The new year brings increased tasks. That engineers are called to assist in solving the great problems of the day—in industry administration, in wise use of natural resources, in applying construction to the needs of recovery, in guidance of regional and national growth, even in the preservation of the spirit of human enterprise—is a privilege that, we know, will inspire the profession's highest powers. Hopeful that Engineering News-Record may have opportunity to share in this service,

The Editors and Publishers
wish all their readers a

Happy and Prosperous New Year

IN THIS ISSUE: Pumping Cement a Mile at Boulder Dam . . . Aerodynamics and the Civil Engineer—IV . . . Outline of a State Public Works Plan . . . Concrete Gravity Dam in a Faulted Mountain Area . . . Roadside Planting Along State Routes in Texas . . . Digestion Rates of Mixed Sludges in England . . . Canada's Public Works Plan Gets Under Way . . . . . Monthly Review of New Books and Pamphlets

Do you know if this man is your *Silent Partner?*

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To Maintain Construction as an Industry

WITH the tone and with much of the substance of the report released by the "Joint Conference on Business Recovery" the construction industry can concur, but it is disconcerting to find in it so scant a recognition of the special problems that beset construction.

This does not result from a failure to see its importance. The report sets forth that the more than 2,000,000 unemployed in construction amount to nearly four times the combined unemployment of all the consumer goods industries. But as a remedy the report offers no more than a plea for governmental policies to foster confidence, a statement of the need for "a free flow of capital into private business, a sound real estate mortgage market and lower construction costs" and a protest against governmental invasion of the housing field.

No note is taken of that substantial share of the normal construction program which includes those works and structures other than housing for both public and private account. Just now a continuance of public works construction is the sole reliance of many engineers, architects, contractors and manufacturers whose goods and services flow into heavy construction. Is it not in order to expect some constructive recommendation on this score?

The report is soundly forthright on governmental invasion of the field of private enterprise. "When government enters a business," it reads, "it competes unfairly with the great mass of its own citizens. * * * Programs for work-relief do not justify the government's entering into competition with its private citizens in the production of goods and their distribution for relief purposes. Government competition dries up the source of its own support."

Excellent—so far as it goes. But why limit so admirable a statement of principle to the production and distribution of *goods* alone? What of services—of construction services in particular? When government buys for its citizens a road, a sewer or a waterworks is there any more reason for it to compete with private enterprise than when it buys shoes or clothes or food for them? The construction industry comprises organizations of engineers, architects, contractors and subcontractors, assembled by private enterprise and implemented by private capital. Governmental agencies have no better excuse for short-circuiting these establishments in favor of wholesale direct employment of engineers, architects, mechanics and unskilled labor than they have for direct operation of shoe factories or textile mills. The latter would be no more unsound than is the former.

It is true that some governmental departments normally employ permanent staffs of engineers and architects and that governmental construction by direct employment is less unusual than governmental manufacturing. For that reason it may be less shocking to the average industrialist. But the distinction is one of degree only and with the present limited demand for construction, the wholesale extension of such a practice is more detrimental to this industry than it would be to any other.

Despite all this, the report recommends the encouragement of "employment on useful public construction projects, not created primarily for the purpose of relief, at wages not in excess of the direct relief payments that they would otherwise receive."

In the name of consistency why is there here no word in behalf of private enterprise? And why the provision "at wages not in excess of direct relief?" If the works are *useful* and *not created primarily for relief*, why shouldn't they be handled through normal channels, by normal methods and at normal wages? Or else, why not go all the way and recommend that all manufacturers who produce any goods bought by the government should pay their employees "wages not in excess of the direct relief payments they would otherwise receive?"

Throughout the report appears little recognition that construction, as an industry, is entitled to equal consideration with other industries. And so there is revealed no understanding that the various programs for work-relief—past, present and projected—and the constant interference in the name of relief with normal construction procedure have tended to disintegrate private enterprise in this vast industry and to substitute for it a species of direct-employment-relief designed to absorb the unemployed of all the other industries.

"Government competition with private business" says the report, "leads toward socialism." And right here in the construction industry, where such competition is making its greatest inroads, is a good place for American business to oppose that trend and thereby forward what it describes in its report as "the one great purpose—the revival of the normal processes of industry and trade."

Willard Chevalier

ENGINEERING NEWS-RECORD

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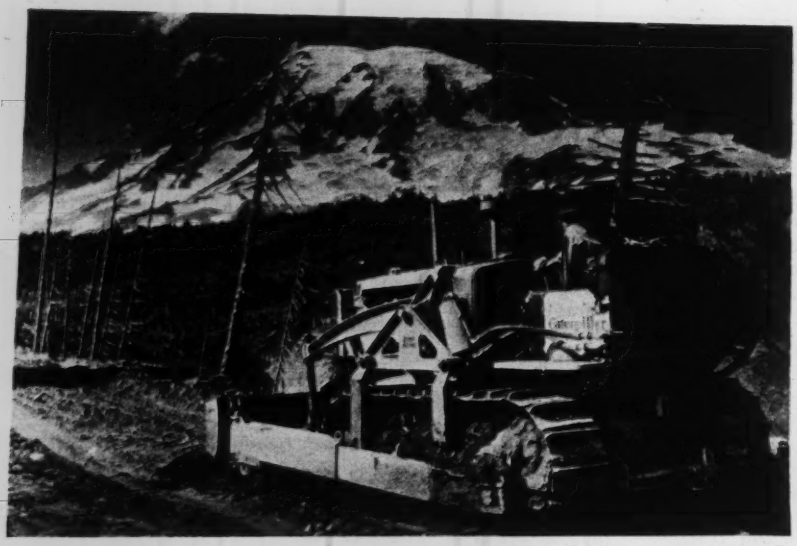

The Colonial Construction Co., of Spokane, Washington, uses "Caterpillar" Diesel power in the construction of a new scenic highway in Rainier National Park.

On a fuel cost of less than a dollar a day, Amador County does road maintenance work with this "Caterpillar" Diesel Tractor near Jackson, California.

"THE 'CATERPILLAR' DIESEL TRACTOR HAS CUT OUR FUEL COSTS 70%"

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AMERICA GOES DIESEL

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C. S. Hill
Chicago
W. W. De Berard

McGraw-Hill Publishing Co., Inc. Editorial and Publishing Offices: 330 West 42d St., New York

F. E. SCHMITT, *Editor* WILLARD CHEVALIER, *Vice-President*

Editorial Staff
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H. W. Richardson
J. I. Ballard
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CONTENTS FOR DECEMBER 27, 1934

VOLUME 113 NUMBER 26 COPYRIGHT, 1934

Transporting Bulk Cement at Boulder Dam.. 811

Aerodynamics and the Civil Engineer—IV... 814
BY W. WATTERS PAGON

Field-Creosoting Plant on Small Job..... 819
BY H. S. RIESBOL

Requirements for a State Public-Works Plan 820
BY V. B. STANBERY

Canada's Public-Works Plan Gets Under Way 821

Concrete Gravity Dam for Faulted Area.... 823
BY SAMUEL B. MORRIS and CECIL E. PEARCE

Roadside Planting in Texas..... 827
BY ALLEN P. CHILD

Digestion Rates of Mixed Sludges..... 828

Unusual Skew-Arch Design in Iowa..... 829

Review of Engineering Literature..... 830

Sewage-Plant Data from Rockford, Ill..... 832

Letters to the Editor..... 833

Editorials 834

Current News 836

In the News:

THE NEW YORK CHAPTER of the A.A.E. has voted to disband in favor of the National Society of Professional Engineers, and voted to contribute $1,300 from its funds to the national body.

IN NEW JERSEY, a report by the State Water Policy Commission to the governor recommends the creation of the New Jersey Water Authority to centralize responsibility for the planning and developing of an adequate water supply for all parts of the state.

A BOND of $750,000 must be furnished by the Milwaukee Sewerage Commission if it appeals the recent court decision which impounds the funds from the sale milorganite for the benefit of Activated Sludge, Inc.

IN THE NORTHWEST, the regional planning conference resulted in active discussion of a coordinated development of the Columbia River and the high dam at Grand Coulee, but did not favor a proposal for establishing a Columbia Valley Authority.

COMPLETION of railway facilities and terminals on the San Francisco-Oakland Bay Bridge project has been assured by an additional loan of $10,000,000 from the RFC.

NEW YORK'S city administration rejected the bids of power companies to furnish power and light to municipal buildings during 1935 and immediately approached President Roosevelt and PWA Administrator Ickes for necessary financing for a municipal plant.

BY A VOTE of 5 to 2 the trustees of the Sanitary District of Minneapolis-St. Paul adopted the chemical precipitation method of sewage disposal.

BECAUSE the federal courts have restricted Chicago's diversion from Lake Michigan to 1,500 sec.ft., the city argued, at a hearing before the district engineer, Corps of Engineers, that it should be reimbursed for the 36-mile main Drainage Canal of 10,000 sec.ft. capacity.

In This Issue:

CEMENT is being pumped successfully at Boulder Dam in larger quantities and through greater distances than heretofore attempted. In all 4½ million barrels of bulk cement will have to be handled. The total distance pumped is 5,420 ft.

STUDIES OF FLOW OF AIR around square prisms and on building models set in wind tunnels have resulted in clearing up many questions raised by the effect of high wind on buildings. The results are discussed in the sixth article of a series on "Aerodynamics and the Civil Engineer."

THREE YEARS' RESEARCH into the digestion rates of mixed sewage sludges in England has revealed valuable information as to what may be accomplished through careful manipulation of sludge-digestion processes.

THE USE OF STIFFENING RIBS on the barrel of a concrete skew-arch bridge greatly simplified the design of an otherwise complicated structure and made possible the use of a relatively thin slab for the barrel.

AN INEXPENSIVE and effective field plant for creosoting lumber by the hot and cold open-tank bath process was developed for erosion-control work in Oklahoma, which showed a treating cost of $12.50 per 1,000 f.b.m.

REQUIREMENTS for a state public-works program with reference to (1) current projects, (2) future works and (3) policies and responsibilities are outlined by V. B. Stanbery, planning consultant, National Resources Board.

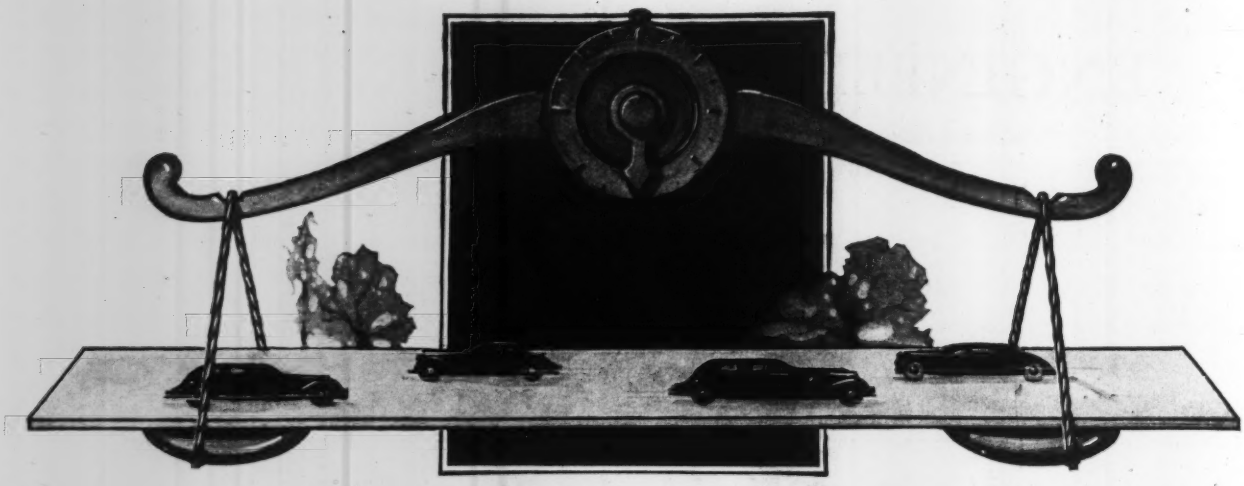
IN CANADA a $53,000,000 public-works program, authorized by a law enacted in June, 1934, is getting under way, and the work being programmed in the various centers is outlined.

UNUSUAL PROBLEMS for a concrete gravity dam were presented by the geological conditions at the Morris Dam site on the San Gabriel River in southern California. The solution is reviewed, and the design is outlined in the present article.

ROADSIDE PLANTING and landscaping, which is a definite part of the Texas highway-maintenance program, is briefly described.

Coming Highway Issue:

THE ISSUE of Jan. 17, 1935, will be devoted to a review of the engineering problems of the future highway. Eight of the leaders of engineering thought in America, acting as consulting editors, have prepared the text of the issue. The result is an inspiring forecast of the wide opportunities of the road builder for progress in research, traffic surveys, line rectification, pavement and bridges design, safety, roadside development and secondary road service.



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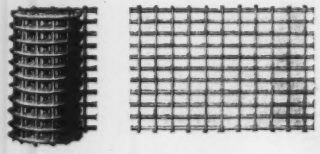

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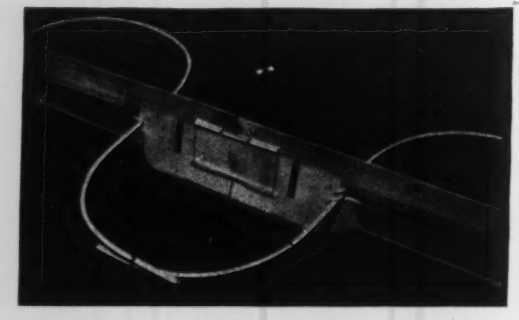

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FIG. 1—THROUGH the 9-in. pipe line coming down the canyon wall at the left and passing off to the right bulk cement is pumped 5,420 ft. from the Boulder Dam blendng plant to the low-level mixing plant.

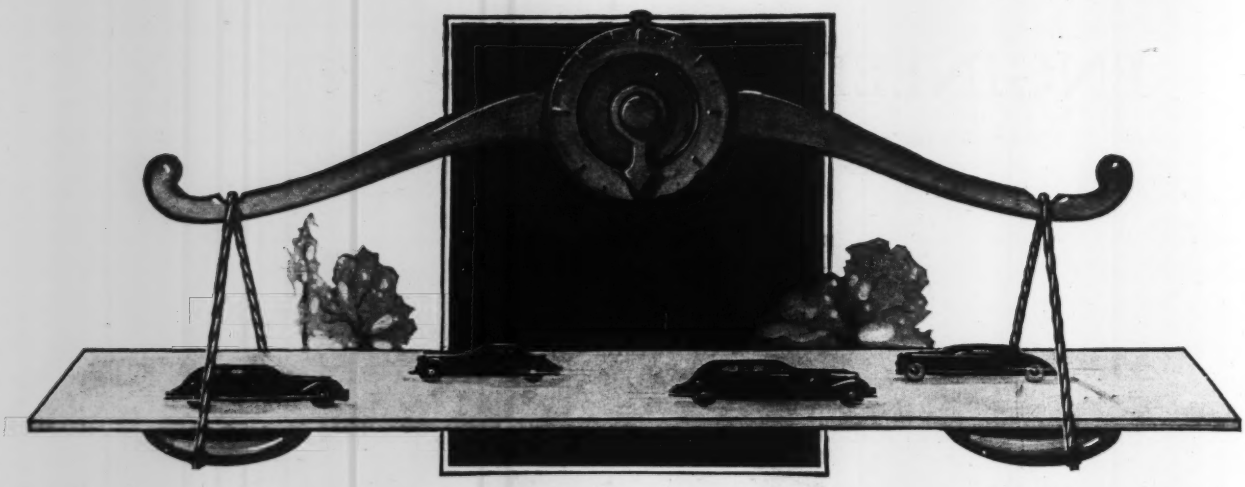
Bulk Cement Pumped a Mile

AT THE TIME the Bureau of Reclamation laid out plans for construction of Boulder Dam and faced the question of handling about 4,500,000 bbl. of cement required for this job, it was obvious that only bulk cement could be considered. When bids were opened for furnishing cement, it was found that each of the mills had bid for only a part of the requirements, and it became necessary to purchase several brands of cement simultaneously. Then, to obtain the most satisfactory results, it was deemed advisable to blend the products of the various mills at Boulder Dam. An order was given to Six Companies for this work, and the contractor elected to build only one blending plant and to transport blended cement from it to the two mixing plants. This they decided to do by the pneumatic method.

The original pneumatic installation included two pumping units, the primary pump and a booster unit midway of the 5,420-ft. length of 9-in. delivery pipe between the high-level and low-level plants. Later the booster unit was eliminated as unnecessary. Progress in developing methods and equipment in handling bulk cement are summarized in the following.

Specifications accompanying the order from the Bureau of Reclamation provide that the government may furnish cement from different mills (five were used part of the time) and will deliver it to the contractors f.o.b. railroad cars at Boulder City. The total quantity involved is about 4,500,000 bbl. The cars of cement are moved by the contractors from Boulder City to the high-level plant on the northerly rim of the canyon, where it is unloaded, stored, blended and pumped to bins over the mixers in both mixing plants. The high-level plant is close to the blending plant; the low-level plant is some 5,420 ft. distant (via the pipe-line route) and at a level about 500 ft. lower.

This set-up was evolved from the initial program of hauling by rail separately to the two mixing plants,



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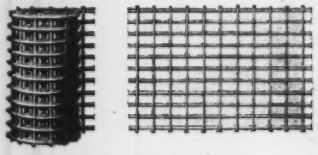

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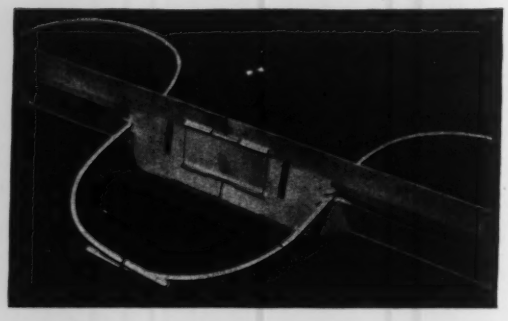

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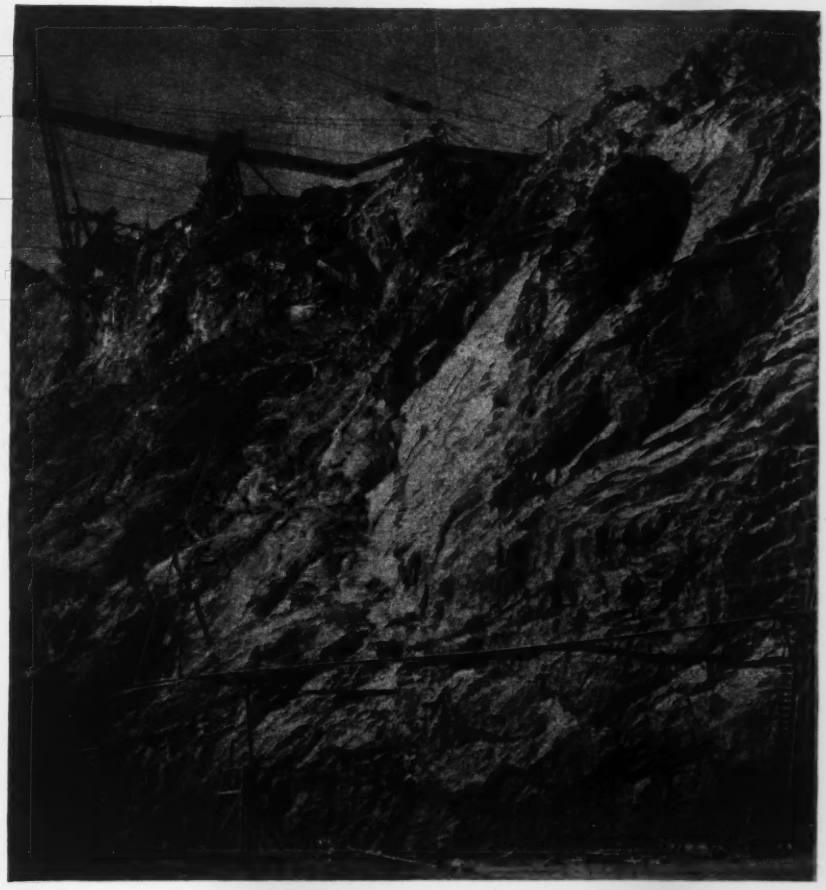

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This set-up was evolved from the initial program of hauling by rail separately to the two mixing plants,

with duplicate unloading and storing equipment at each plant.

Under the plan of operation as finally developed, when cement cars arrive at the storage silos adjoining the high-level plant, motor-driven cement pumps mounted on wheels and arranged for portable use are moved directly into the box cars; the suction intake of a pump driven by a 40-hp. motor is thrust into the cement, and it begins to flow through a 5-in. delivery pipe into one of the storage silos. One operator handles each of these portable machines, but a helper is required in moving the attached wires and hoses when moving the unit about or from car to car. Under service conditions these portable pumps each average about 125 bbl. per hour, or about twelve 300-bbl. cars per day of three eight-hour shifts. The compressed-air requirement of the portable machines is about 125 cu.ft. of free air per minute, usually delivered at 90 lb. per sq.in. There is but little lift between box cars and storage silos. Spare machines are on hand to take care of maintenance and repairs, so that the contractors depend upon continuous operation of the portable units.

Cement storage at the blending plant is provided by eight 6,000-bbl. steel silos into which the inlet piping system is so arranged that any of the portable unloading pumps can deliver to any of the silos. Cement from each mill is stored in a separate silo. Specifications prohibit storage of cement more than 60 days in any silo or bin, and careful check of operations is made to insure observation of this rule.

The process of blending cement from the several mills is given careful attention to insure uniformity of chemical content, strength, rate of setting, heat of hydration, etc. (*ENR*, Dec. 21, 1933, p. 737). To give exact control in proportioning cement from the several mills, each silo has vane feeders mounted beneath its outlet driven by 2-hp. motors whose speed can be controlled accurately at any desired rate from a delivery of 50 to 200 bbl. of cement per hour. These vane feeders deliver to screw conveyors which discharge into a 500-bbl. bin over the main pumping unit. Controls from the several screw conveyors and from the main pump are interlocked so that it is impossible to continue delivery in any part of the system after the system beyond that point has ceased to function.

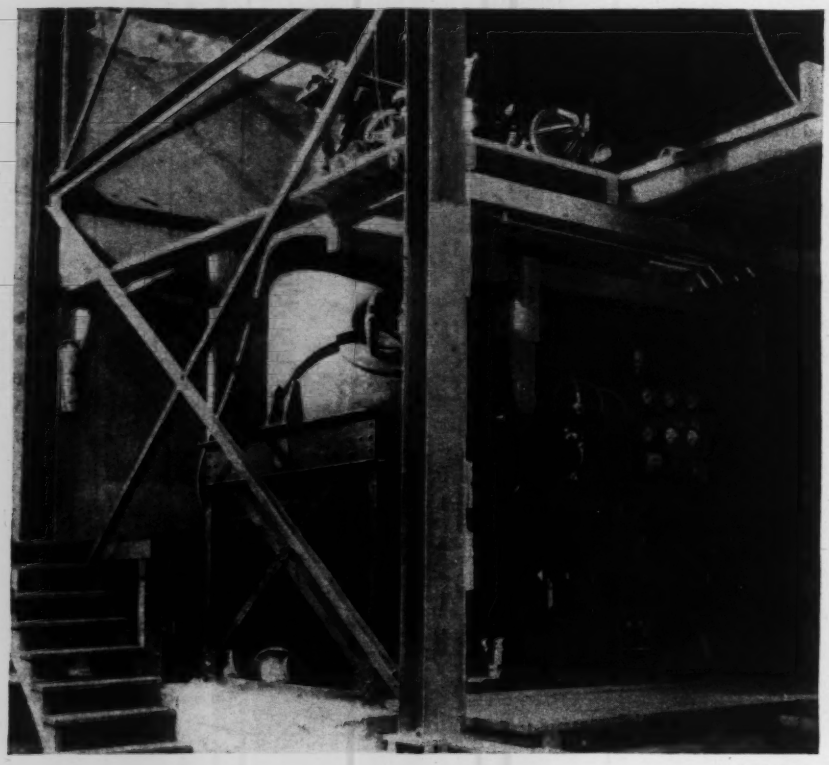


FIG. 2—MAIN CEMENT-PUMPING EQUIPMENT for the 5,420-ft. line is entirely automatic, as evidenced by this view of the pump station.

Because of the importance of having the cement delivery system between the two plants of maximum dependability, it was decided at the outset not to try to deliver for the entire 5,420-ft. distance, which greatly exceeded any previous pneumatic delivery, in one operation, but to use two pumps, placing one at the starting point and another at a convenient location near the midpoint of the delivery line. The two pumping plants were electrically interlocked so that pump No. 1 would stop automatically whenever cement in the surge bin over pump No. 2 reached a predetermined height. A control switch at the low-level plant permitted the operator to stop pump No. 2 at any time, and this in turn automatically stopped pump No. 1, though not until the pipe between the two pumping stations had been cleared of cement.

Compressed-air pumping of cement from the high-level to the low-level plant, using the two pumping units operating in relays, replaced rail delivery in July, 1933. (The rail delivery meant an additional haul of 14.5 miles with grades up to 3 per cent.) Relay pump operation continued from July until December, 1933, when an experiment was made with through delivery from pump No. 1, bypassing pump No. 2. This proved so successful without material decrease in capacity that pump No. 2 was taken out of the line and has not been used since that time. Operating records show that with the usual volume of 450 bbl. of cement per hour (a 550-bbl. rate has been attained frequently) the 5,420-ft. delivery can be accomplished by one pump with 10 to 11 per cent *less* compressed air than was required for delivering the same quantity of cement with the two pumps operating in relay. Using the single pumping unit, in normal operation, the average free-air requirement for delivery through the 5,420-ft. line is about 2,000 cu.ft. per minute.

The delivery line for the full 5,420 ft. is a 9-in. welded steel pipe laid out with the objective of reducing friction by keeping curves to a minimum radius of 12 ft. Indication of the contractors' caution in preparing for trouble was the laying of a 2-in. compressed-air pipe line alongside the 9-in. welded line, into which connections were provided at intervals of a few hundred feet, controlled by globe valves. In the event of clogging in the delivery pipe, jets of air were to be turned on to aid in freeing the line. The small emergency air line has seldom been needed.

Each of the main pumping units include two 50-bbl. tanks mounted side by side on a structural support, each with entry and delivery pipes (both air and cement) from common supply and delivery lines in which valves are interlocked so that while those on one tank are in position for receiving cement and air those on the other tank are in position for discharging. Under this arrangement there is constant movement of material into the 9-in. delivery line, with minimum risk that the cement will stop in transit and choke the pipe. As fast as the filling of one pump tank by gravity through the inlet valve is completed, the interlocked valves operate, and delivery from the empty pump tank is supplemented by delivery from the full tank. These cycles reverse periodi-

FIG. 3—BULK CEMENT is unloaded from box cars by these portable units handling about 125 bbl. per hour.

cally under control of the automatic mechanism which governs operations. No moving parts in the form of screw conveyors are involved; compressed air is the only motive power aside from a 1-hp. motor used for agitating the cement as it enters the pump tank and two ¼-hp. motors which operate the valves for changing the source as the tanks fill and empty.

Briefly, the action that takes place within each of the 50-bbl. tanks is as follows: The tank is, in function, a mixing chamber into which cement enters through a large pipe at the top well over to one side. Air enters at two points; most of it comes in through a plunger valve at the lower end of the cone-shaped bottom of the tank. This valve opens at the proper time in the cycle to admit air just below the end of the discharge pipe, which extends vertically through the center of the mixing chamber and terminates just above the air valve at the bottom. The second air admission is through perforations in a small pipe around the inside of the mixing chamber just above the cone-shaped section.

After the machine has been adjusted, to secure continuous operation with regular automatic reversal of cycles, it is only necessary to turn on the power. Air pressures within the chamber vary; the 90-lb. pressure in the air-supply line never obtains in the chamber because of the constant escape through the outlet valve during the time that air is being admitted. The maximum chamber pressure, rather, is about 50 lb. per sq.in. when discharge starts. As delivery continues and despite the constant air supply, the pressure within the chamber gradually falls to about 20 lb. per sq.in. before the outlet valve is closed and delivery from the other unit begins.

The rate of cement delivery is set at a predetermined rate by regulation of the valve admitting air to the pump. Once set in operation, the system is wholly automatic. As the changes are principally the opening and closing of valves, delivery of cement continues until the electric current is shut off or until there is some interruption of delivery, such as would be caused by a clogging of the delivery line. In either of these events the pump would shut down. If the supply of cement stops, the pump will not start delivery from the partly filled 50-bbl. tank. However, delivery of compressed air to the 9-in. line would not stop until that line had been cleared of cement. This provision is made because of the anticipated difficulty of starting up with a considerable "dead load" of cement deposited in the delivery line.

Storage of blended cement over each of the 4-yd. mixers at the high-level plant is provided by cone-bottomed steel silos with a 5,000-bbl. capacity. At the low level plant 4,000-bbl. timber bins with steel-lined hopper bottoms are used.

The portable pumps used in unloading the freight cars are made by the Fuller-Kinyon Pump Co. The main cement transport pumps are "Fluxo" units supplied by F. L. Smidth & Co., New York. Handling the bulk cement is part of the contract of Six Companies, Inc., for whom Charles A. Shea is director of construction. F. T. Crowe is general superintendent, and A. H. Ayers is chief engineer.

The contract is carried out under the direction of the U. S. Bureau of Reclamation, R. F. Walter, chief engineer, and Walker R. Young, construction engineer.

Hume Dam on Murray River, Australia Completed for Regulation

THE HUME DAM, largest engineering undertaking in Australia since the Sidney Harbor Bridge, has been completed on the Murray River as a joint project of the government's, of Victoria and of New South Wales. Work on the structure has been under way since plans were completed in 1919, and the cost is estimated at $27,000,000. The 1,250,000 acre-ft. of storage in the reservoir formed will be used for regulation of river flow, conservation and extensive irrigation developments.

The Murray River is the largest stream in Australia, and a program of comprehensive development was instituted through the passage of the River Murray Water Act in 1917 by the legislatures of the four interested commonwealths. The entire program includes construction of an extensive series of river weirs and locks in the lower reaches of the stream and two large storage reservoirs, one formed by the Hume Dam.

The catchment area above the Hume Dam site is about 6,000 square miles. The storage provided by the present structure is 1,250,000 acre-ft., with provisions for the addition of spillway gates that would raise the capacity to 2,000,000 acre-ft. There is a possibility of a 37,000-hp. hydro-electric development at the dam; outlets have been provided, but plant construction has not been started.

Granite rock on one side of the dam site made possible a concrete structure for a distance of about 1,000 ft. (280 ft. for the outlet works and the proposed power house and a 720-ft. spillway section). On the south, or Victoria, side of the river, the depth to rock made an earthfill section economical, and this embankment extends 3,900 ft. and contains about 4,000,000 cu.yd. of fill. The concrete in the overflow section totals 550,000 yd. The structure is 106 ft. high to the fixed spillway, and the proposed 20-ft. height of spillway gates will raise the crest to a height of 126 ft., to provide the 2,000,000-acre-ft. capacity.

The earth-embankment section has a reinforced-concrete corewall extending into solid granite, a 3-to-1 slope on the upstream face that will be paved with concrete and a downstream slope varying from 2 to 1 to 2½ to 1. The concrete corewall extends almost to the crest and is backed on either side by a section of selected material. In addition, there is a thickness of porous concrete placed immediately behind the corewall which collects possible seepage and feeds it into an inspection gallery near the base of the core wall. The corewall varies in thickness from 6 ft. at the base to 2 ft. at the crest and is reinforced with two rows of ⅝-in. bars spaced 14 in. apart vertically and 8 in. apart horizontally, at a distance of 6 in. in from the faces.

The water stored in the reservoir has already been allocated to the several states bordering on the river. After providing for regulating the flow for navigation use on the lower river and for domestic and riparian supplies, the remainder will be available for irrigation use. The amount of land on which the water will be used has not been estimated and will depend upon the type of crops.

The foregoing information was obtained from a paper in the *Journal* of the Institute of Engineers, Australia, by H. H. Dare, commisisoner, Water Conservation and Irrigation Commission, New South Wales, and the River Murray Commission.

Aerodynamics and the Civil Engineer—IV

Wind-Tunnel Studies Reveal Pressure Distribution on Buildings

Tests of square prisms yield information on turning and overturning moments, scale effect and effect of eddies—Mill-building models demonstrate importance of suction forces—Internal pressures with various amounts of wall openings

By W. Watters Pagon
Consulting Engineer, Baltimore, Md.

THE THREE PREVIOUS ARTICLES in this series were published March 15, 1934, p. 348; July 12, 1934, p. 41, and Oct. 11, 1934, p. 456. —EDITOR.

WIND-TUNNEL TESTS on models of buildings are a very recent development as compared with the building art. In 1895 Irminger, at Copenhagen, made a test in a minute wind tunnel and was perhaps the first to report suction on roofs. In 1912 a test was made at Purdue University on two building models, one rectangular, with a low-pitch roof, the other semi-cylindrical. In the same year a test was made by Costanzi of the Italian army on an airship hangar. In 1914 Eiffel reported his study of the hangar at Belfort, with and without monitor, and showed that there was no scale effect on three models whose dimensions were in the ratios 400:50:8. In 1928 Arnstein published the results of a model test of the airship dock at Akron. In 1932 Sylvester published at Rensselaer Polytechnic Institute the results of tests on three models of the Navy's Lakehurst hangar, of lengths 1, 2 and 4 ft. with wind at 90, 135, 150, 180 and 270 deg. to one end, the last named being made because there were sliding doors at one end only. The Navy has also made tests on the Sunnyvale hangar in California. At the Bureau of Standards, Dryden and Hill tested a prismatic model and a model of a mill building, with and without monitor. Irminger and Nokkentved have reported tests on a number of rectangular building models, with differing roofs. Recently tests on a model of the Empire State Building have been published by the Bureau of Standards, also tests on the same model with adjacent buildings, by C. L. Harris, of Pennsylvania State College, to determine the effect of interference.

All tests agree in showing a variable pressure on the near face of a rectangular building and suction on the end and rear walls and on the roof in general, when the wind is 90 deg. to the front face. For other angles the results are complex, usually showing high suction.

Smeaton probably evolved the first formula for building pressures, $P = 0.005V^2$, where P is in lb. per sq.ft. and V in m.p.h. The Weather Bureau progressively reduced the coefficient to 0.004 and finally 0.0033. About 100 years ago Duchemin developed his formula from studies on projectiles, and Hutton evolved a more complicated formula. Duchemin's formula has been and still is used extensively, although it does not tell the designing engineer what he needs to know about the actual pressures developed, nor about any suction. All formulas apparently were developed for flat plates and not for solid bodies; and whereas the force coefficient for small plates varies from 1.11 for square, to 2.00 for infinitely long rectangular plates, as already discussed (*ENR*, March 15, 1934, Fig. 2, p. 350), it is 1.3 to 1.5 for a 1:1:5 prism discussed below, and varies from about 1.0 for a small cube to 2.0 for an infinitely long prism.

Constancy of drag coefficient

It has already been brought out that when the flow pattern is known the pressure can be predicted with reasonable accuracy, but the flow pattern is not the same for all bodies at different scales, positions, velocities and turbulence. For rounded bodies (previous reference) the drag coefficient varies with Reynolds Number, the decrease in drag being correlated with change of flow pattern and frequency of eddies. In other words, there is a "scale effect," so that model and prototype differ unless R is the same for both; and this signifies the same flow pattern, because R is a ratio between the viscous forces of the boundary layer and the inertia forces of the free flow. But sharp corners and sharp-edged bodies throw off eddies at all civil engineering velocities, because of the infinite theoretic velocity that would occur for an Eulerian flow past the sharp edges, so that the drag is constant for all sizes and velocities, with the exceptions noted below.

Again, formulas used heretofore have intimated that the pressure is uniform over an entire surface. But consider the pressure distributions, first of an ideal fluid and then of an actual one. At the center of a symmetrical surface normal to the flow direction, or at a similar point of an unsymmetrical surface or of one at an angle to the flow, there is a stagnation pressure, $\frac{1}{2}\rho v^2$ (v in f.p.s.). On all sides of this point there is an outward flow parallel to the surface, so that as the edges are approached Bernoulli's theorem requires that the pressure must decrease in proportion to the velocity squared. (In *ENR*, March 15, 1934, and Figs. 1 and 5, were shown the streamlines for infinitely long plates and the pressure contours for square plates.) Hence surrounding the stagnation point (or line) there must be contours of equal velocity and of equal (but diminishing) pressure. This pressure cannot decline indefinitely, hence near the edges there must be a contour of lowest pressure. In the theory of discontinuous flow it is assumed that the velocity at the edges is equal to the free stream velocity, which gives better agreement to some extent, but it implies zero pressure on the rear and side faces of the body, which is distinctly not in accordance with fact, as previously described. The discontinuous surface in all actual cases soon becomes a sheet of eddies, which roll up in a "street" of eddies or form a stationary eddy behind the corner.

Test of a square prism

In Fig. 2 of the present article is shown the ideal flow about an infinite square prism at three angles to the wind. In Fig. 3 are shown the pressures for ideal and discontinuous flow (and from actual test) for the square prism discussed below, with corrections as were described previously. Dryden and Hill's test of a prism whose sides were in the ratios 1:1:5 is shown by contours of the pressure on face A when it is normal to the wind (90 deg.), and also when at 105, 120 and 135 deg. (See Fig. 4). Beyond 135 deg. the con-

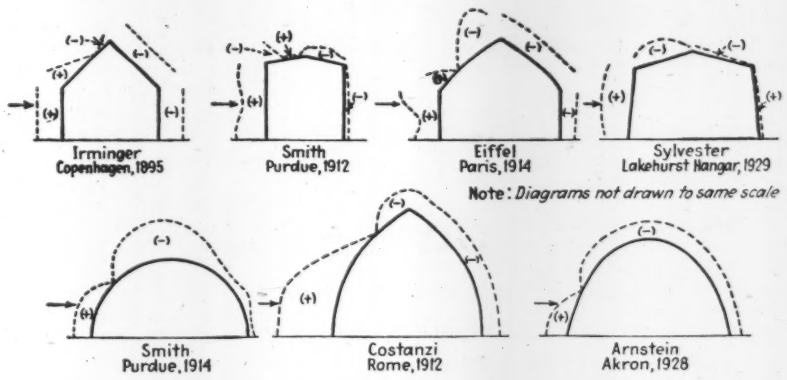


FIG. 1—PRESSURE AND SUCTION AREAS on various airship hangar models as determined in wind-tunnel tests.

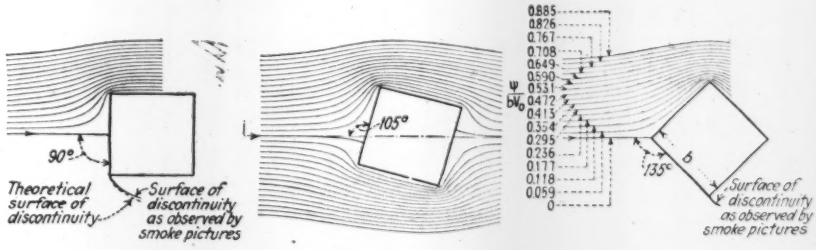


FIG. 2—DIAGRAMS OF IDEAL FLOW around an infinite square prism with wind at three different angles to the face.

ditions on the next face, B, continue the series.

Tests were made with the model standing on the wind-tunnel floor, and also on a small platform. In the first position the wind velocity in the tunnel varied considerably up to approximately half height, but for the latter it was nearly constant. The model in the second position will be discussed in this article because of this greater uniformity. However, the former shows a velocity variation similar to that which occurs near the ground surface for actual buildings, as follows:

Height Above Tunnel Floor, In.	Speed in Per Cent of Speed at Top Per Cent
3	83.5
4	87.0
6	91.5
8	95.0
10	97.0
12	98.5
14	99.0
18	99.8
24	100.0

For wind at 90 deg. the total normal force coefficient (i.e., total normal pressure divided by q and by the area of face (A) is roughly 0.8 on face A, but on the three other faces there is a suction of 0.8, 0.7 and 0.8, and on the roof a suction of 0.8. The distribution on face A is shown in Fig. 4, left; that on the other faces was almost uniform. The total drag coefficient of the prism was about 1.5, showing that the suction on the rear is equal in importance to the front pressure. There was no turning moment, and of course the lateral forces cancel. When the model was rotated 15 deg., so that face A was 105 deg. to the wind (second from left, Fig. 4), the stagnation line was found to have moved from the center toward the "leading edge" by almost 25 per cent of the face width b. A second face, B, is now "seen" by the wind, and on it is a suction of 1.1 at the leading edge, holding constant—at mid-height—for a distance of $\frac{1}{4}b$, then rapidly declining to the last pressure holes that were near the "trailing edge." Near the top there is alteration of the contours of both faces, as also for all other angles to the wind because of flow over the eaves. The rear faces have an almost constant suction of 0.5 to 0.7 in the wake of the body. There is a moment tending to turn the prism so as to place face A normal to the wind.

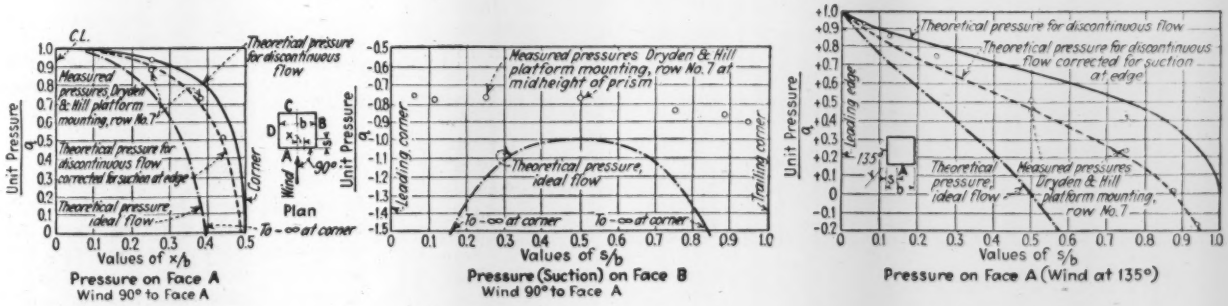
For wind at 120 deg. (Fig. 4, third from left) the stagnation line of face A is close to the leading edge, and the pressure declines across the face to 0.1. The other leading face, B, now has a suction of 0.2 near the leading edge, which changes rapidly to a pressure of 0.3 at about the quarter point, and then gradually declines to a suction of 0.3. Thus, if the pressure is plotted normal to the face, the curve is wavelike. The side B spills the flow over the eave, causing a roof suction of 1.2 near the eave. The suction near the leading edge of B is due to wind spilled around the leading edge from face A. This is discussed later. The discontinuity surfaces indicated on Figs. 2 and 6 show the theoretic (and actual) breaks in the fluid as far as they are traceable; they soon disintegrate into eddies and lose their definiteness, but they indicate the nature of the flow.

For wind parallel to the diagonal of the cross-section (135 deg.), the plot of roof suction develops into an inverted saddle, with a maximum suction of 2.1 on one side and—due to some dissymmetry—of 1.8 on the other (Fig. 4, right). Probably pressure holes nearer the edges would have shown still greater suction. Faces A and B are now symmetrical with the wind, and both have a stagnation pressure of 1.0 at the leading edge, declining almost linearly to a suction of 0.1 at the trailing edges. The rear faces remain at a suction of about 0.5 to 0.7.

Turning moment

At 135 deg. the turning moment on face A is a positive maximum—i.e., tends to rotate this face back to normal, and at 165 deg. it is a negative maximum. At about 150 deg. the resultant force is zero, but there is still a couple,

FIG. 3—PRESSURE INTENSITIES on faces of a square prism for wind at 90 and 135 deg. to the front face A.


C.L.
Theoretical pressure for discontinuous flow
Measured pressures, Dryden & Hill platform mounting, row No. 7
Theoretical pressure for discontinuous flow corrected for suction at edge
Theoretical pressure, ideal flow
To -∞ at corner
Corner
Unit Pressure q
Values of x/b
Pressure on Face A
Wind 90° to Face A
Plan
Wind
90°
Measured pressures Dryden & Hill platform mounting, row No. 7 at midheight of prism
Theoretical pressure, ideal flow
Leading corner
Trailing corner
Values of s/b
Pressure (Suction) on Face B
Wind 90° to Face A
Theoretical pressure for discontinuous flow
Theoretical pressure for discontinuous flow corrected for suction at edge
Leading edge
135°
Theoretical pressure, ideal flow
Measured pressures Dryden & Hill platform mounting, row No. 7
Values of s/b
Pressure on Face A (Wind at 135°)

hence the resultant force passes off to infinity. From 180 to 360 deg. there is almost no eccentricity for face A, indicating a wake of nearly uniform suction.

A stick in a running stream will turn crosswise. An airship without control surfaces or a vessel with a broken rudder will place itself broadside. This prism model shows the same effect and has a moment tending to turn face A square with the wind and faces B and D parallel with it (or vice versa), so that the whole model tends to square itself with some face normal to the wind. Compare this with the reported torsion of the Meyer-Kiser Building (a narrow, rectangular building) in the Miami hurricane of Sept. 16, 1926 (*ENR*, Oct. 14, 1926). The pressures and turning moment on flat plates have been discussed previously (*ENR*, March 15, 1934), and in Fig. 3 of the present article are shown theoretic and actual pressures at angles of 90 and 135 deg.

Dryden and Hill found that the maximum turning moment of the entire prism is equivalent to a lateral displacement of the resultant force by $0.083b$—i.e., by 16.6 per cent of the half-face width (see Fig. 5).

It is of interest to note the effect of this turning moment, combined with the drag and lift forces, on a square building. Assume that there are $n \times n = n^2$ columns uniformly spaced at distance s. The polar section modulus is $\frac{sn^2(n+1)}{3\sqrt{2}}$, with torsional shears at 45 deg. to either bending axis of a corner column. At 105 deg. the eccentricity of the wind is $0.083b$ and the torsional moment is $0.083Fb$, causing shear, $s_t = \frac{0.083Fs(n-1)}{sn^2(n+1)} \cdot 3\sqrt{2} = \frac{0.35F(n-1)}{n^2(n+1)}$, with 70.7 per cent of this—i.e. $\frac{0.25F}{n^2}\frac{(n-1)}{(n+1)}$, acting normal to, and also parallel to, the column webs. From Fig. 5 the sum of the front and rear forces is $0.985F$, but there is also a force of $0.18F$ at right angles to this. F is the resultant force.

About one axis of the corner column, the bending moment is proportional to $\frac{F}{n^2}\left[0.985 + 0.25\left(\frac{n-1}{n+1}\right)\right]$ and about the other axis to $\frac{F}{n^2}\left[0.18 + 0.25\left(\frac{n-1}{n+1}\right)\right]$

Assume for simplicity that the radii of gyration about the two axes are equal. Then the resultant stress will be proportional to

$$\frac{F}{n^2}\left[0.985 + 0.18 + 2 \times 0.25\left(\frac{n-1}{n+1}\right)\right] = \frac{F}{n^2}\left[1.165 + 0.50\left(\frac{n-1}{n+1}\right)\right]$$

Common practice bases the design for wind stress on $\frac{F}{n^2}$ alone. The bracket depends upon the number, n, of columns in a row. For $n = 2$, its value is 1.32; for $n = 5$, 1.50; for $n = 10$, 1.58. If we consider 1.50 to be representative, we see that the wind stresses should be increased (above present practice) by 50 per cent for a square building. For other rectangular buildings, the increase would be greater, but no test results are available to tell how much.

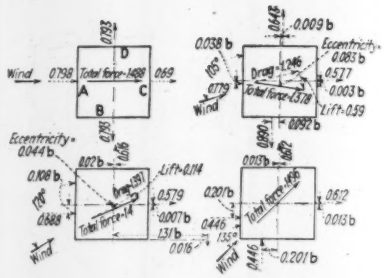


FIG. 5—FORCE COEFFICIENTS for Dryden and Hill 1:1:5 prism on a platform mounting in the wind tunnel. Coefficient = force ÷ q b h, where q is the stagnation pressure, b is the width and h is the height of the prism.

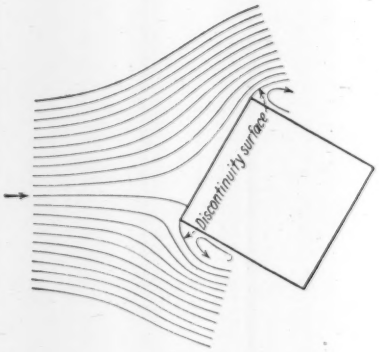
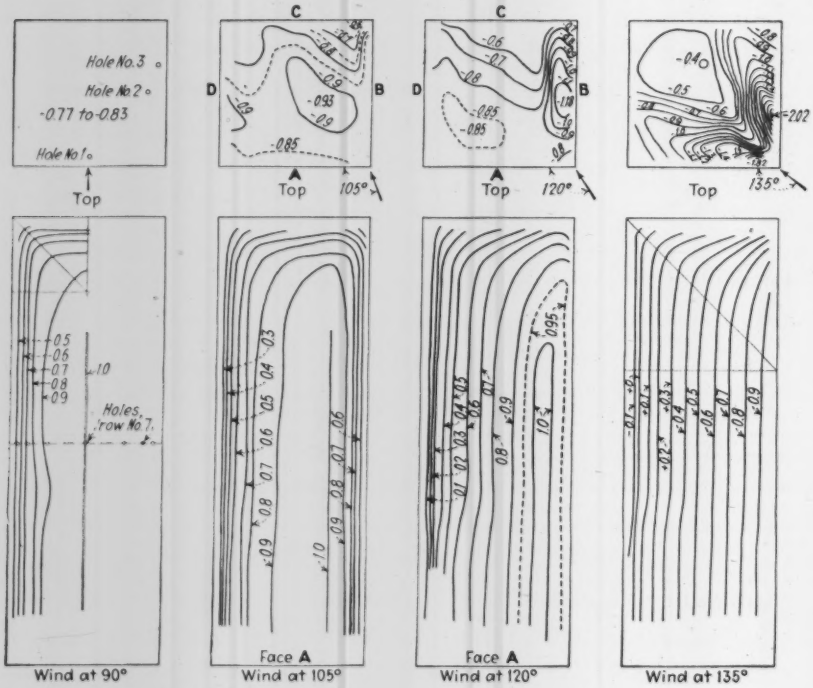


FIG. 6—FLOW DIAGRAM of a prism, showing discontinuity and eddies behind corners.

FIG. 4—PRESSURE CONTOURS on front face and top of a square prism for wind at four different angles to the front face.



Force variation with wind direction

The total force coefficient for face A is about 0.8 for 90 deg., 0.0 for 150 deg., and —0.9 for 165 deg. The total for the entire prism varies remarkably little with the wind direction as shown in Fig. 5. It is noteworthy, however, that the resultant force on the prism is markedly skewed to the wind, except for symmetrical cases, so that there is a strong "lift" normal to the wind, as on an airplane wing. The maximum lift coefficient is 0.59; the "drag" (parallel to the wind) varies from 1.246 to 1.496; the resultant or total force varies from 1.378 to 1.496. These all refer to the horizontal forces, but the roof suction also causes an upward component that acts contrary to the weight of the roof and building, with a coefficient varying from 0.787 to 0.822.

Scale effect

In general, the authors found no scale effect, and at four different speeds the force coefficients were almost constant. Some typical points on the roof, however, were found where scale effect

showed itself. (See Holes No. 1, 2, 3 on Fig. 4, left.) These were all in the region near the eaves where the flow from the front face(s), passing over the sharp eave(s), caused eddy flow on the roof when face A was 135 deg. to the wind. Flow in an eddy region may have scale effect. The writer has noted that the frequency of eddies behind a flat plate varies as does that of the eddies trailing behind a cylinder or sphere in the vortex street. If there be change of frequency with R, there is scale effect in the vicinity. The tabular results follow:

Velocity, M.P.H.	Hole No. 1	Hole No. 2	Hole No. 3
27.3	—0.96	—1.16	—0.92
40.9	{—0.96 / —1.16}	—1.57	—1.01
54.5	—1.15	—1.67	—1.02
68.2	—1.23	—1.67	—1.05

Since two results are given for the first point at a velocity of 40.9 m.p.h., it appears that at about 40 m.p.h. a change of flow occurred, and that above this speed there was no further change. This seems to be confirmed by the two other points because they show a sudden jump at 40.9 m.p.h. and then are almost constant. The total drag or force coefficient, however, showed no scale effect.

Effect of eddies

Clearly, on those faces which the wind can "see" (say A and B), there *tends* to be pressure, but if flow spilled from face A (when more nearly normal) reacts on face B, the velocity of this may reduce the pressure and even cause suction in accordance with Bernoulli's law, depending upon the relative angularities. The diagram of ideal flow (Fig. 2) shows the crowding of streamlines at the corners, indicating high velocities for which the mathematical treatment is incomplete because it neglects compression; this figure also shows the theoretic (and actual) discontinuity surfaces. Often there is formed a stationary eddy behind a corner within the discontinuity surface, and the flow contracts aft of this eddy (Fig. 6). As it contracts, it produces pressure (i.e., diminished suction), and aft of this reverts to suction again. This resembles the condition for face B when face A is at 120 deg., as already described. But at times the eddy is not stationary, periodically detaching itself and passing downstream, causing an oscillating flow that will rattle windows but that may be "ironed out" by the pitot-tube manometer so as not to be observable.

The writer's office is so situated that when the wind is normal to one wall there is much suction at windows on the wall that is parallel to the wind. This suction has been sufficient to open a door against the spring of a mechanical door-closing device.

The visual effect of such an eddy may be seen on a moving railroad car window in a rain storm. Due to the relative speeds of the train, V, and of the falling raindrop, U, slanting streaks form on the glass, with a tangent of U/V. But the eddy behind the forward window jamb exerts a forward velocity $-V$ on the drops, diminishing in amount as the distance increases. Hence the drops are deflected by different amounts across the glass, and those near the front jamb may even be deflected forward, so that the effect of all of them is fanlike.

An eddy at the corner of a building, or behind a buttress of a church, will cause leaves to whirl in a miniature waterspout, and such a whirl due to a sudden local gust has been observed to persist for perhaps 10 sec. or more. The after-deck of a steamer is often partly enclosed with glass, so as to diminish the effect of the eddies. The enclosure cannot destroy the "circulation" of the eddies, but it can permit them to have a larger diameter and therefore less rotational velocity because circulation equals velocity times circumference.

Overturning moment

The overturning moment about the base of the model shows a center of pressure for the entire force at slightly above mid-height—i.e., 52 per cent—when the model was mounted on the tunnel floor. But when mounted on the platform 2 ft. high in the 10-ft. wind tunnel, the center of pressure was at about 47 per cent of the height, due to the wind spilled over the eaves.

Mill-building model

Dryden and Hill investigated the pressures on a mill-building model 48 in. long, 24 in. wide, 6 in. high to the eaves, and with a 20-deg. pitch roof, making the total height of the model 10.35 in. In a later test they added a monitor 29 in. long, 1.6 in. high to the eaves and with a 20-deg. pitch roof. The main roof had no overhang at the eaves, but there was a 0.1-in. overhang for the monitor roof. The pressure holes were well distributed, and there were close clusters at the gables and at the ends of the monitor—i.e., in the regions of rapid changes of pressure. The model stood on a platform 5 ft. above the lowest part of the tunnel floor, and the platform, which was 15 ft. long, was beveled at its upstream edge, to reduce disturbance to the flow.

Tests were made for the model at 90 deg. to the wind for face A, and then 135 and 180 deg., the latter being endwise to the wind. The wind speed was 47, 60 and 80 f.p.s. and "rarely did that (the pressure recorded) for any one speed differ from the mean by more than 0.02 in." Fig. 7 is reproduced from the paper reporting the investigations and gives the contours of pressure for the wind normal to face A. The relative areas for faces A to F were 1.000, 2.127, 2.127, 1.000, 0.681 and 0.681, and for the corresponding monitor faces AA to FF were 0.161, 0.346, 0.346, 0.161, 0.033 and 0.033. With the monitor in place, roof slopes B and C were reduced to 1.805.

If the X direction is positive from A toward D, Y direction from F toward E, and Z direction upward, then the average pressure coefficient on the faces, normal and in the three component directions is as shown in the accompanying tables.

The greatest horizontal wind force occurs for a wind direction of 45 deg.

PRESSURE COEFFICIENTS FOR MILL BUILDING WITHOUT MONITOR

Face	Angle 0° Normal	Angle 0° Cx	Angle 0° Cy	Angle 0° Cz	Angle 45° Normal	Angle 45° Cx	Angle 45° Cy	Angle 45° Cz	Angle 90° Normal	Angle 90° Cx	Angle 90° Cy	Angle 90° Cz
A	0.498	0.498	....	....	.255	.255	....	....	—.354	—.354	....	....
B	—.381	—.130	....	.358	—.441	—.150	....	.415	—.381	—.130	....	+.359
C	—.563	+.191	....	.529	—.774	+.263	....	+.728	—.381	+.130	....	+.358
D	—.518	+.518	....	....	—.517	+.517	....	....	—.354	+.354	....	....
E	—.620	....	+.620	....	—.449	....	+.449	....	—.205	....	+.205	....
F	—.620	....	—.620	.000	+.372	....	+.372	....	+.615	....	+.615	....

PRESSURE COEFFICIENTS FOR MILL BUILDING WITH MONITOR

Face	Angle 0° Normal	Angle 0° Cx	Angle 0° Cy	Angle 0° Cz	Angle 45° Normal	Angle 45° Cx	Angle 45° Cy	Angle 45° Cz	Angle 90° Normal	Angle 90° Cx	Angle 90° Cy	Angle 90° Cz
A	.498	.498	....	....	.255	.255	....	....	—.354	—.354	....	....
B	—.238	—.081	....	+.224	—.245	—.083	....	+.230	—.340	—.116	....	+.320
AA	+.441	+.441	....	....	+.180	+.180	....	....	—.197	—.197	....	....
BB	—1.026	—.351	....	+.965	—1.312	—.446	....	+1.234	—.251	—.086	....	+.236
CC	—.560	+.192	....	+.526	—1.370	+.466	....	+1.288	—.251	+.086	....	+.236
DD	—.488	+.488	....	....	—.938	+.938	....	....	—.197	+.197	....	....
C	—.584	+.200	....	+.549	—.691	+.235	....	+.650	—.340	+.116	....	+.320
D	—.518	+.518	....	....	—.517	+.517	....	....	—.354	+.354	....	....
E	—.620	....	+.620	....	—.449	....	+.449	....	—.205	....	+.205	....
EE	—.913	....	+.913	....	—.762	....	+.762	....	—.250	....	+.250	....
FF	—.913	....	—.913	....	—.160	....	—.160	....	—.850	....	—.850	....
F	—.620	....	—.620	....	+.372	....	+.372	....	+.615	....	+.615	....

The monitor roof has higher suction than the main roof. Local loads on various faces are more than twice the average load on the face.

It is of interest to quote the authors in regard to scale effect: "In a few instances in regions where the pressure gradient was very steep and the pressure was unsteady, there were systematic changes with speed. The number of such stations and the area represented by them is so small, however, as to be of no importance in computing the force coefficient. Over the range of speeds covered by the tests, the observations indicate that the scale effect is small.

"It is the judgment of the authors that the results obtained on the model can be applied directly to full-scale structures without causing errors of any consequence. At present this judgment cannot be proved experimentally in a direct manner. It is based on studies of the available information, including actual experiments on bodies of many types, and under widely different conditions. The mechanism of scale effect is gradually becoming understood, and the reason for the large-scale effect on bodies of rounded form, such as spheres, cylinders, and airship hulls, is found in the development of the boundary layer theory. From the same reasoning, it is believed that the scale effect on bodies with sharp edges cannot be very large, and is probably absent altogether. The engineer must accept the judgment of the aerodynamical physicist on this point unless he is willing to qualify as an expert in aerodynamics by study and experimentation."

Internal pressure

The pressure within a perfectly airtight building would of course be unvarying with change of barometer or the alteration of external pressure due to air flow. But all buildings leak air to a considerable extent around windows and doors, at chimneys and even through the walls, so that the internal pressure is a function of the *average* outside pressure on walls and roof. The over-all force coefficient and the overturning moment are of course independent of the internal pressure, but the force coefficient of any wall or roof is the resultant of external and internal pressure. If only one opening (e.g., an open window or door) is available to the wind, the internal pressure will of course be that of the pressure in the boundary layer at that opening. This may be anything from the stagnation pressure, q, to the maximum suction, according to the position of the opening. Irminger and Nokkentved quote Orsted, who in 1838 described an American tornado, "where a sudden drop in external air pressure caused so powerful an internal pressure that the building blew up and fragments of clothes were found jammed into cracks in the walls." In a perfectly airtight house a barometric drop of 0.8 in. ($2\frac{2}{3}$ per cent) would cause 55 lb. per sq.ft. outward force on walls and roof, "and the house would burst asunder."

To approximate the leakage of actual buildings, they made pressure tests within a model 2x3.9x2 in. high, with 45-deg. roof slopes. The holes were 0.04 in. in diameter, and there was the same percentage of hole area in each wall and roof slope. The area of holes varied from $4\frac{2}{3}$ to $15\frac{2}{3}$ per cent. The results, when referred to the stagnation pressure, did not differ for speeds of 42.6 and 65.6 f.p.s., nor appreciably with the percentage of hole area. The shape of the building, however, caused a marked difference, while the effect of the angle of the wind to the front face was even more noticeable.

Provided the area of holes is not excessively large, the air passing in and out will behave according to Bernoulli's formula and will have a velocity proportional to the square root of the pressure difference at each hole. By the "equation of continuity" the total flow must be zero, hence $\Sigma A\sqrt{p} = 0$, where the summation covers all holes, with proper signs for in-and-out flow, and A = area of one hole. The pressure p is the difference between outside and inside pressures, the computation being made by progressive assumptions of the internal pressure until the summation equals zero. From tests on buildings 2x3.9x2 in. high, with 20, 45 and 60 deg. slopes on a factory building of one and three bays and on a building 2x2.75x1.58 in. high, with a curved roof of 0.4-in. rise, they found variation between the test pressure and the computed result from 0 to 10 per cent.

It should be noted that *all internal pressures were suctions*, because the external suctions exceed the pressures both in area of surface and in coefficient.

The last-named building was tested for the effect of holes of different size. The results follow, and in order to establish the relationship to an actual building, the number of windows of size 6.56x3.28 ft. that would have the same percentage to a wall 98x33 ft. is given in the last column by the number of windows full open or with an .08-in. crack or a .02-in. crack all around its perimeter:

Hole Diam. Inches	Per Cent of Wall Area	Full-Scale Descriptive	Comparison Number of Windows
0.28	5.4	Many windows full open	8 at full area
0.20	2.8	Some windows full open	4 at full area
0.08	0.4	Many shut but leaky windows	30 with .08-in. crack
0.07	0.03	Nearly airtight windows	16 with .02-in. crack

With large holes on the windward side and roof, there was 0 to 10 per cent less pressure. On the ends (i.e., parallel to the wind) and on the leeward side the 0.08-in. holes caused about $-0.29q$, the 0.20-in. holes about $-0.20q$ to $-0.30q$, and the 0.28-in. holes about $-0.12q$ to $-0.29q$ (but in most cases, $-0.26q$ to $-0.29q$). With the windward wall entirely removed and all holes closed, the internal pressure was $+0.83q$ to $+0.86q$; with the leeward wall entirely removed and all holes closed, it was about $-0.12q$. For the large holes there was some difference in pressure on the

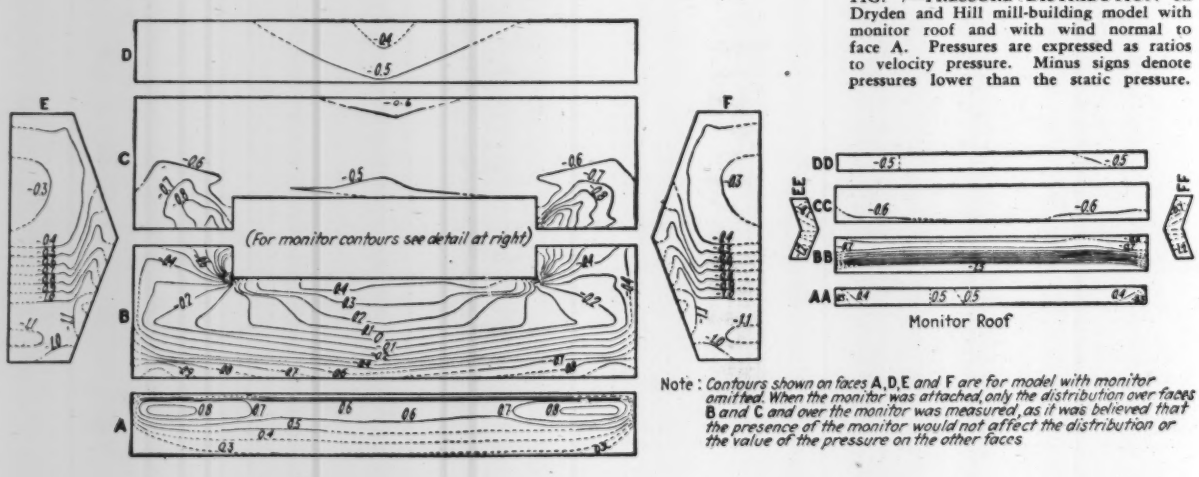


FIG. 7—PRESSURE DISTRIBUTION on Dryden and Hill mill-building model with monitor roof and with wind normal to face A. Pressures are expressed as ratios to velocity pressure. Minus signs denote pressures lower than the static pressure.

Note: *Contours shown on faces A, D, E and F are for model with monitor omitted. When the monitor was attached, only the distribution over faces B and C and over the monitor was measured, as it was believed that the presence of the monitor would not affect the distribution or the value of the pressure on the other faces*

inside faces of the windward and leeward walls, due probably to the impact of the inside velocity. Of course there were no internal partitions in the model, which would have some effect by causing differences in pressure between rooms on opposite sides.

The following tabulation shows the effect on internal pressures of angularity of the wind to the front face A.

Body	90 Deg.	135 Deg.
Cube, 2.0″x2.0″x2.0″....	—0.41q	—0.19q
Prism, 1.6″x1.6″x3.9″....	—0.43q	—0.05q
Building 2.0″x3.9″		
roof slope = 20°.....	—0.325q	—0.265q
" " = 30°.....	—0.37q	—0.21q
" " = 45°.....	—0.34q	—0.155q
" " = 60°.....	—0.36q	—0.11q

Internal suction reduces the external suction in its effect on roofs and rear walls but adds to the effect of pressure on walls that have pressure. An impervious roof covering, such as tin, felt, copper, etc., tears off more readily, however, unless provided with relief flaps.

Quoting the authors: "When the copper roofing on Ribe Cathedral in Denmark was renewed about 25 years ago, the importance of the relief holes that had been in the roof from olden times had been forgotten and they were removed, with the result that the new roofing was torn off during the first storm after the repair. The holes were replaced, and there was no trouble whatever since. A roof sufficiently permeable to air will never tear off, while the very tight copper, felt and zinc roofs will often do so; it is the internal pressure which destroys them."

Field-Creosoting Plant for Small Construction Job

By H. S. Riesbol
Junior Civil Engineer, U. S. Dept. of Agriculture, Guthrie, Okla.

FOR THE PROTECTION of timber going into the construction of hydraulic-measuring and erosion-control devices, the Red Plains Soil Erosion Experiment Station near Guthrie, Okla., recently built a small wood-preserving plant which has proved to be economical and more effective than most field methods for the preservation of timber. The principal elements of the plant are shown in the accompanying illustration.

Open-tank baths

A careful study of all the common methods of applying creosote to lumber indicated that the hot and cold open-tank bath process was the most practical for the conditions to be met at the experiment station. By this method the lumber is first placed in a creosote bath at a temperature of 200 deg. F. and left for 1½ hours. This causes expansion of the air and water in the pores of the wood. At the end of this period the lumber is removed from the hot creosote bath and dropped immediately into a cool creosote bath, where the cooling of the air and water in the pores of the lumber forms a partial vacuum, and as a result a large amount of preservative is drawn into the lumber. The lumber is permitted to remain in the cool bath for 1½ hours and then is lifted out and placed upon a drain rack adjoining the cooling tank for at least the same length of time, to permit surplus oil to drain from the lumber into the cooling vat. A mixture of one-half coal-tar creosote and one-half used motor oil is employed.

The two vats are the principal element of cost in the construction of such a plant. They were made by removing both heads from four 55-gal. oil drums and one head from each of two other drums, and then butt-welding the drums together to form a long cylinder. This cylinder then was split down the center with a welding torch, to form the two semi-cylindrical troughs or vats.

The vat for hot oil was set between two 4-in. concrete walls, held together with ½-in. round tierods, and by flat slabs of concrete 6 in. deep by 12 in. wide at each end of the vat. Iron lugs on the wall support the vat. Special care was exercised in closing the joint between the firebox and top of the vat to keep the fire from reaching the inflammable oil in the vat.

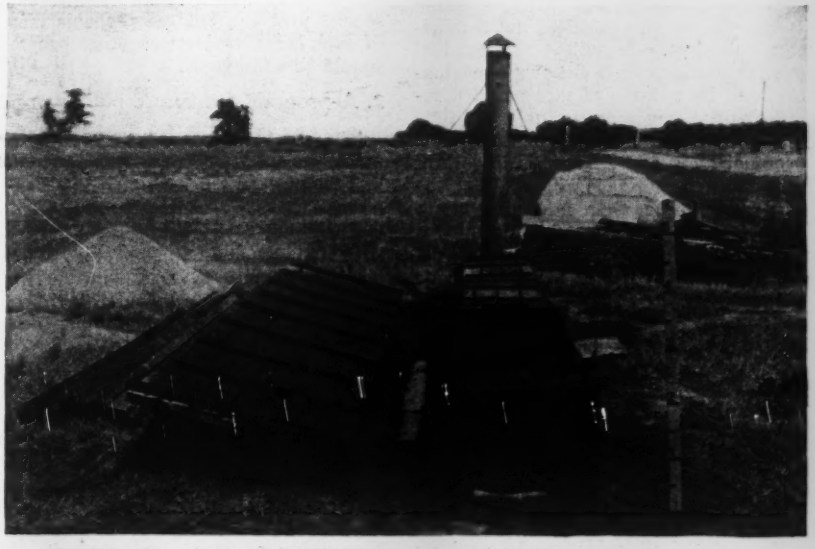
Openings were left at both ends of the fire box, and two openings were provided at the side to facilitate stoking. A draft was provided by removing one head from another oil barrel and mounting a sheet-iron smokestack over a hole near the opposite end, pushing the open end of the oil barrel into one of the open ends of the fire box and chinking the opening around it with heavy clay. This stack can be moved from one end to the other, depending upon the direction of the wind.

To obtain the full capacity of the vat, wooden cross-bars are used with a loop of wire at each end to be hooked over bolts embedded in the concrete side walls. After the lumber has been put in the tank, the bars are fastened down across the top of the tank to keep the lumber submerged.

In handling the hot creosoted lumber, a Z-shaped hook has been found effective, about 12 in. long, made of ½-in. round reinforcing bar with one end of the horizontal Z-legs sharpened to a dull chisel point that can be readily inserted between planks.

For yellow pine lumber of 2-in. thickness, as creosoted at the Guthrie Station, the total consumption of a 50-50 mixture of creosote and used motor oil is about 50 gal. per 1,000 f.b.m. With creosote at 50c. per gallon and used oil free for haulage, the cost of preservatives is $12.50 per 1,000 f.b.m., or 1¼c. per bd.ft. The capacity of the plant is from 175 to 200 f.b.m. per 1½-hour period, depending somewhat upon the dimensions of the lumber to be treated. The tanks take lumber in lengths up to 17½ ft.

The design and construction of the plant were carried out by the engineering staff of the U. S. Bureau of Agricultural Engineering at the experiment station.



FIELD-CREOSOTING PLANT built for treatment of lumber used in building hydraulic-measuring and erosion-control structures.

Outline of Requirements for a State Public-Works Plan

Objects defined and methods of approach to planning outlined—Integration of current and future programs called for—Federal, state and local responsibilities classified

By V. B. Stanbery
Planning Consultant, National Resources Board, Portland, Ore.

COMPETENT engineering planning has long been employed to assure the highest economy in design and construction. Intelligent economic and social planning is now recognized as necessary to achieve the greatest benefits from public works as a whole.

The purpose of engineering is to accomplish a desired result with the minimum expenditure. The purpose of planning is to obtain the largest human benefits from funds available, and moneys expended. These aims do not conflict. Any rational plan presupposes the utmost economy in its execution.

The problem of public-works planning may be summarized as follows: to survey conditions and needs of each community and of the state as a whole; to analyze proposed or possible projects and to appraise the usefulness and value of each project in relation to its cost and to existing conditions, needs and future possibilities; to define responsibilities for originating and financing different classes of projects and the extent of justifiable allotments; to outline a continuing program of public works that will return as far as possible the largest ultimate gains to the greatest number of people.

A comprehensive state plan for public works will be an evolution, not a fabricated product. It will be a gradual growth resulting from the proper evaluation and integration of many varied relationships. Since much study and time will be required for the evolution of the eventual plan, and since it is important that some tentative plan, at least, be available in the near future, some of the steps and processes for developing a rational plan will be presented.

The first objectives are to provide an intelligent program for future public-works construction; to establish policies and responsibilities for different classes of projects; and to indicate ways and means for deriving the fullest use and benefits from public works, past, present and future.

A suggested agenda for each of the three objectives is as follows:

1. Integration of current projects

A study of all public-works projects now under construction or authorized for the purpose of coordinating these projects in their mutual relationships and in relation to existing facilities to develop the largest possible use and value therefrom. This requires consideration and analysis of the following:

The purpose or use for which each project is intended.

The physical, economic and social relationship of each project to its community and to other parts of the state and region.

The examination of possible uses, other than those for which the project was originally intended, and the determination of extensions to, or expansion of the original project to provide additional uses or greater benefits.

The desirability of new or additional construction projects which might be built as an adjunct to, or in connection with, the current project to increase its output or value.

The desirability of further fact-finding, study or research work in connection with the project, which might result in wider benefits or uses.

As an illustration of what may be accomplished by such studies, provision for the migration of stranded farmers from submarginal lands to irrigation projects may be cited. Large federal public-works projects for which economic surveys are now being made by several agencies may be treated as a special problem, but the probable effect of such large projects on other projects should be considered.

2. A program for future public works

The existing conditions, present facilities and needs of each community and of the state as a whole must first be carefully surveyed and studied to determine what new projects are most needed and desirable. This study should be carried out in collaboration with local planning commissions, other local agencies and federal, state and other bodies who are engaged in studies related to this problem or who have knowledge of particular conditions and needs.

A survey should be made of possible public-works projects, both those already suggested or proposed and other projects that might be originated or discovered. These projects should be thoroughly analyzed and studied. All aspects of each project, such as sponsorship, location, type, use and purpose, relative need and importance, cost, effects, benefits and self-liquidating possibilities, should be considered. From these approximations some basic principles may be outlined, priorities established, recommendations composed and a tentative preliminary report submitted.

Work-relief projects should be reviewed and considered particularly in relationship to local and state needs. The program should include effective and desirable work-relief projects to be carried out when funds are provided in the future.

Possibilities for stabilizing the construction industry and related industries in the state through a balanced long-term program of public works should also be considered.

3. Policies and responsibilities

The determination of sound policies and the proper division of responsibilities for the different classes of public-works projects require study and consideration of the following:

1. The separate and joint responsibilities of local, state and federal authorities in relation to: (*a*) Unemployment relief, (*b*) conservation and development of natural resources, (*c*) initiating and sponsoring of public-works projects, and (*d*) financing of the different classes of projects.

2. General influence of a state-wide public-works plan on communities and on individuals.

3. The benefits to be gained from each class of projects and the effects and range of these benefits.

4. The relative need and value of unemployment relief and direct relief in each locality; the rational division of public funds between these two methods of relief, and the inclusion of public works (both construction projects and study projects) as far as practicable under expenditures for direct relief.

5. The relative economy and efficiency of construction by the contract method compared with the force-account or day-labor method.

6. Particular types or kinds of projects that should be undertaken by different agencies, such as type of projects to be carried out by the ERA, by PWA, etc., by reason of particular features involved in construction, in location and in purpose or use.

7. Uniformity in hours of labor, wage rates for each class of workers, and preferences in employment for rural areas and for metropolitan areas. Also preference to be given to use of materials produced within the state.

8. Methods for financing preliminary work, such as surveys, engineering studies and reports, etc., so that projects may be submitted to and passed upon by the proper authorities. (Possibility of a revolving fund for this purpose).

Benefits from public works are both direct and indirect. The direct benefits are easily recognized and appraised.

The indirect benefits are none the less real, although they may often be more obscure and difficult to estimate.

Before any definite recommendations are made, some rough approximations should be determined. Analyses should be made to show a general picture of the relationships of both current and proposed projects to present unemployment and relief conditions, to local populations and their financial status and to other existing conditions. Previous allotments of public-works funds to communities now proposing new projects should be taken into account to prevent a particular community from being unduly favored. Close contact should be maintained with representatives of city and county planning commissions throughout the state, so that information relative to local conditions and needs will always be available.

The analyses should also bring out the salient features of each project, such as the relative need, uses and purposes, probable revenues, benefits and effects and their extent and importance. Projects may be classified in separate groups, and the groups then considered as a whole.

The necessity for further fact-finding projects and surveys in connection with future public-works construction should be shown. The importance and need of research projects should be emphasized.

The effects of a few large projects of wide benefits, compared with a greater number of diversified and scattered projects should be considered and appraised as far as possible.

The relative desirability of projects may be estimated roughly by the number and extent of benefits to be gained from each project and the number of people affected thereby.

The cost of each project must be carefully reviewed and an attempt made to give priority to those projects that will provide the greatest total benefits per dollar of allotment. Self-liquidating or partially self-liquidating projects, which will probably produce some financial return, may be given a reasonable preference over non-revenue projects.

In making these approximate determinations the relations of public works to other public activities, to private industry and commerce and to the general economic and social life of the state should be reviewed so that the plan will be truly state-wide in its intangible effects as well as in physical scope. The plan should indicate the further obligations and functions of private enterprise and of individuals themselves to derive the fullest benefits from public works.

An intelligently planned program of public works should produce cumulative effects in developing natural resources and in improving social conditions that are unattainable from detached unrelated projects.

Canada's Public-Works Plan Gets Under Way

Work restricted to projects under federal jurisdiction—Engineering done by existing organization —Program reviewed and larger projects outlined

THE Canadian public-works program introduced in June, 1934, by the federal government as an unemployment-relief measure is getting slowly under way after a somewhat delayed start, except for the initiation of some smaller jobs for which plans had already been prepared. In the eastern part of Canada the first of the larger contracts have now been awarded, and bids on other important projects are being called so that a general review of the situation is opportune at this time.

Financing plan

The program was introduced in the Federal House of Commons by Prime Minister Bennett June 19, 1934, when he presented two associated bills, which were subsequently passed. The first of these provided for the issue of an additional currency amounting to $52,871,003, bringing the total currency of the Dominion to $223,981,952. This inflationary measure was explained by the Prime Minister as being in accord with resolutions passed at the World Economic Conference in London, the Dominion gold reserve being more than adequate to cover the additional money to be put into circulation at the approved percentage for gold backing. The second bill included all the public works contemplated under the emergency program, to be paid for with this new currency issue, introduced for the express purpose of "the stimulation of industrial recovery."

Department directing work

The Dominion government, under the provisions of the British North America Act, is limited in its public-works program to interprovincial bridges, federal public buildings (post offices, customs houses, militia armories, etc.) and structures on navigable waters. All work falling in these three classes comes under the jurisdiction of the department of public works of Canada, operating as two separate divisions, engineering and architecture. In addition, the department of railways and canals has charge of all public canals, including work on the St. Lawrence waterways and special federal work like the development of the port of Churchill on Hudson Bay.

The department of marine has charge of all aids to navigation and associated works, which include a few special wharves and the St. Lawrence ship canal. Hydrographic surveying also is under this department, as well as the operation of many wharves constructed and maintained by the federal department of public works.

All work in the main ports of Canada is under the jurisdiction of the local harbor commissioners. These commissioners are appointed in several different ways (principally by the federal government) and maintain their own engineering staff and occasionally their own construction staffs. Nominally, these commissions come under the jurisdiction of the department of marine, and formal approval of engineering plans for harbor work is necessary from the engineers of the department.

Money for the public-works program is being provided by the federal government, which eliminates a system recently introduced for some works that provided for paying contractors with short-term, non-interest-bearing bonds of the respective harbor commissioners. The calls for bids and award of contracts are being handled directly by departments of the federal government. The cooperation of the harbor commissions' engineering staffs is usually secured. In the eastern section of Canada the department of marine is the organization concerned with this type of work, but the extensive works to be carried out in Toronto harbor are being handled by the Toronto district office of the department of public works.

No special organization

All of the work involved in the public-works program, so far as engineering is concerned, is being handled by the existing permanent staffs of the respective departments. This has tended to place a heavy burden on these staffs, especially as there have been no general increases, or even replacements, in governmental staffs during the last three years. Small temporary additions only

to the departmental staffs have been made.

The bulk of the construction work involved in the program (although this ratio does not apply to actual expenditure) is being spent on numerous small works, generally wharves, scattered around the navigable waters of eastern Canada and serving the numerous small communities on the larger rivers and lakes. As illustrating the number of such structures being maintained by the Dominion government, it is of interest to note that in the three branch offices of the department of public works located at Halifax, St. John and Rimouski, more than 2,000 small harbor works are normally handled.

Because of the number of individual jobs being undertaken under the present program, it is impossible in a brief survey to refer specifically to the smaller works, and individual reference will only be made to the larger projects. This necessarily obscures the fact that many of the smaller projects have their own peculiar and interesting design and construction problems.

The following notes describe some of the major projects.

Important projects

Halifax—About $2,000,000 is to be spent in various harbor improvements and repair work. A new bulkhead and pier are to be constructed, and extensive repairs and reconditioning are to be done on some old grain-elevator galleries. A new public building, estimated to cost $500,000, is to be built (bids called Nov. 27), and a selected group of contractors has been asked to present bids for the extension of a pier, to be used as a coal berth and industrial site, estimated to cost $400,000. E. H. James, Montreal, is consulting engineer to the harbor commissioners.

New Brunswick—Work at St. John harbor is concentrated on the reconstruction of berths 1 to 4, which will involve construction work costing more than $2,000,000. This harbor was described in detail in *ENR*, Feb. 15, 1934, p. 219. The proposed new work will be at the outer end of the harbor. Because of the difficulties involved in this work the federal government appointed a special engineering board, consisting of the chief engineers of various departments. This board visited the site to study the problems and later submitted a report that was to provide the basis of design, but the resulting designs did not prove to be generally acceptable, and the problem is being studied further. It is probable that construction work on this project will not be undertaken before next spring.

At Moncton a public building estimated to cost $620,000 is being built. In Fredericton, the capital city of the province, the federal government has taken over an old city wharf to be rebuilt. This project is of particular interest as illustrating the extent of the federal work being carried on by the public-works department because projects under its direction now extend up the St. John River almost to the international boundary. This is based on the fact that the stream is a navigable waterway.

Province of Quebec—Most of the small works being carried out in this province are along the St. Lawrence River and consist principally of repair and reconstruction of many wharves that serve the smaller communities located along the river. The individual projects are too numerous to mention in detail, but among the larger ones are a wharf-reconstruction plan at Pointe-au-Père, extension of a wharf at Pointe-au-Pic, and wharf reconstruction at the Port of Sorel. In many cases the work involves the use of steel or concrete piling to replace existing timber structures. E. Gohier, Montreal, is consulting engineer for the Chicoutimi and Three Rivers harbor works.

Quebec and Montreal

City of Quebec—Among the important projects being carried out under the direction of the harbor commissioners is a wharf extension, estimated to cost $730,000, and construction of a new transit shed ($463,000). Contract has been awarded for the latter work, which is expected to start soon.

City of Montreal—In addition to the large Postal Terminal Building, estimated to cost $1,500,000, the works program includes a new armory ($200,000) and the completion of the Examining Warehouse for the Customs Service. The latter building was constructed in 1913, and at that time the foundation was built for a second section, to be constructed under the present program. Bids were called on Nov. 20 for this work, which is estimated to cost about $2,000,000.

About $1,000,000 will be spent in harbor improvements at Montreal. The harbor commissioners are carrying out paving work to cost $534,000 by day labor. Contracts have been awarded for several wharf-completion and reconstruction jobs, and bids have been called for the reconstruction of the old raceways that carry water between the Lachine Canal and the Windmill Point Basin, within the limits of the harbor commissioners' property. The rebuilding of these old raceways is a necessary preliminary to the reconstruction of the Windmill Point wharf, estimated to cost more than $300,000.

Province of Ontario—Work is confined generally to new public buildings, repairs to existing buildings, and general wharf and harbor work at many of the harbors located on the shores of the Great Lakes. Two of the most notable of these have been at Midland and Oshawa, each contract involving about $100,000; these are now generally complete. In addition, notable additions are being made to the federal government buildings at Ottawa, in the form of a new Postal Terminal, a new Record Storage Building and a new headquarters for the Royal Canadian Mounted Police, as well as an extension to the Royal Canadian Mint Refinery. The estimated cost of all this work approximates $2,000,000. Preliminary work is well advanced, and early calls for tenders are expected.

In the city of Toronto the existing Customs Building is to be extended, at a cost of about $600,000, a new postal station is to be constructed, and important new harbor works are to be carried out. The major item, for which bids were received on Dec. 4, includes an area of almost 90,000 sq.ft. to be enclosed by steel sheet piling bulkhead walls, relieving platforms and a filling with pumped sand. Two existing wharf walls are being reconstructed. Another important public building will be that at Hamilton, estimated to cost $1,750,000.

In the western section of Ontario there are two major projects, an extension to the Port Arthur breakwater, to cost $400,000, and a public building at Fort William at about the same figure.

Work in Western provinces

Prairie Provinces—Federal public works in the prairie provinces, naturally, are somewhat restricted in volume. In addition to new public buildings at Winnipeg, Man. ($1,500,000), Regina, Sask. ($400,000), Banff, Alberta ($150,000), and a new barracks at Calgary, Alberta, for which a contract has already been awarded for $1,200,000, two important special bridge projects will be undertaken under the program. At Selkirk, Man., the Red River is to be crossed, with a structure estimated to cost $250,000; at Outlook, the Saskatchewan River is to be bridged with a $275,000 structure. Finally, bids have just been called from a selected list of firms for the construction of a timber-pile retaining wall along the Bow River at Calgary, estimated to cost $150,000.

British Columbia—The coastal province has some interesting wharf projects included in the program and an important improvement scheme for the mouth of the Fraser River estimated to cost $300,000. In addition, there are to be two public buildings built in Vancouver at a cost of about $1,000,000, the preliminary plans for which are complete, with tenders to be called probably before the end of the year.

The total cost of all the projects included in the program amounts to $39,865,600. The expenditure of this money will be spread over about two years, at the present rate of progress. The amount has been assailed as being far too small, and some criticism has already been voiced with regard to the award of certain contracts.

Practically all the work is being let out to contract.

A Concrete Gravity Dam for a Faulted Mountainous Area

Morris Dam for Pasadena, Calif., water supply provides for earthquake resistance, numerous outlets for stream regulation and a spillway in a difficult location

By Samuel B. Morris
Chief Engineer and General Manager;
and Cecil E. Pearce
Formerly Designing Engineer, Pasadena Water Department, Calif.

MORRIS DAM, built by Pasadena, Calif., on the San Gabriel River to augment the municipal water supply, presented several unusual problems of design. The 328-ft. concrete gravity-section structure required special provisions for (1) a fault that crossed the site, (2) unusually large outlet capacity for steamflow regulation in accordance with complicated water rights, and (3) a spillway in a difficult location. The construction of the dam was started April 26, 1932, and the structure was dedicated May 26, 1934, just 25 months after ground was broken. During the construction period the structure was known as the Pine Canyon Dam.

The reservoir formed by the dam will store 39,300 acre-ft. to supplement the present domestic water supply of Pasadena, which is obtained from deep wells. A continuing decline in the groundwater level with accompanying increase in pumping costs was a major reason for instituting the Morris Dam development program.

Construction equipment and the methods used in placing the 450,000 cu.yd. of mass concrete in the structure have previously been described (*ENR*, May 25, 1933, p. 671). At that time design details covering special features of the spillway had not been completed, and it was impossible to review this phase of the work. This article reviews the development of the dam design, its details and the appurtenant works.

The San Gabriel River above the dam has a drainage area of 210 square miles of rugged mountainous territory, varying from El. 930 at streambed at the dam to 6,000-10,000 ft. at the crest of the ridges and peaks. The mean annual runoff is 115,000 acre-ft. The maximum discharge has been 410,000, and the minimum 9,600 acre-ft. The mean daily discharge varies from 3,000 to 40,000 sec.-ft.

Water rights complicated

The city of Pasadena was granted permits to water of the San Gabriel River by the California division of water resources, after intensive hydrographic studies of the stream extending over a period of five years. These permits, in effect, grant the city the right to store and divert only the actual quantity of water that would waste to the sea under natural conditions of unregulated streamflow. The city is therefore compelled to release: (1) all water heretofore diverted from surface streamflow, constituting the total flow of the river up to 90 sec.-ft., which is diverted through a conduit 6 miles long through the Azusa power plant, owned by the city; (2) the natural underflow and low-water flow at the dam site amounting to about 1 sec.-ft.; (3) all water that would naturally percolate into the ground in the river channels between the dam and the sea. This quantity is determined by the use of a diagram embodied in the permits applied to the actual measured daily runoff and the elevation of groundwater in the central San Gabriel Valley.

After each flood the quantity of water chargeable to percolation is determined, and this quantity is released in regulated flow so that this water will percolate into the ground and not waste to the sea. The water remaining in the reservoir after such release is then salvaged floodwater which the city has the right to divert for use in the Pasadena water-supply system.

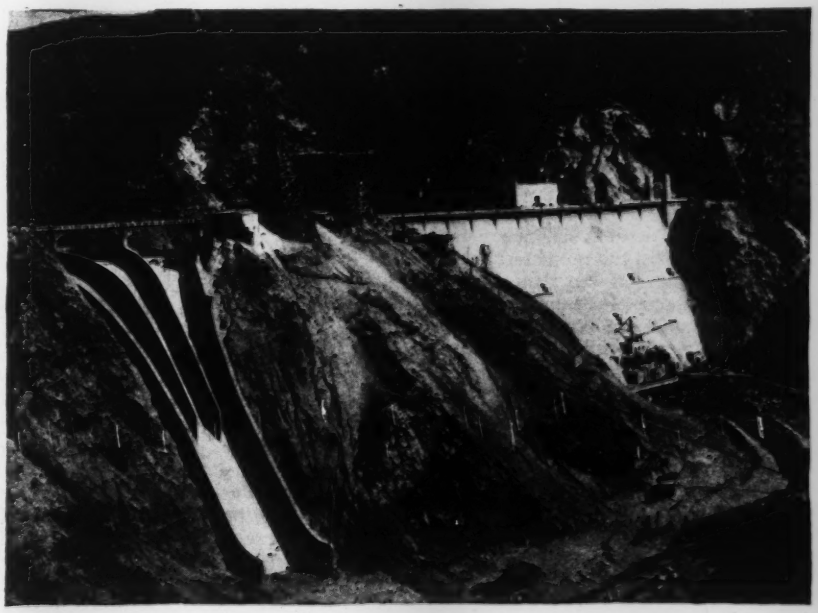
Geology of the dam site

The San Gabriel Mountain Range is a great block of metamorphic and igneous rocks, lying between two major fault zones, the San Andreas rift on the north and the Sierra Madre fault at the face of the mountain range on the south. As a whole, the range is an uplifted block or horst. The main mass is divided into subsidiary blocks by various minor faults, the principal one of which, the San Gabriel Fault, has determined the erosion of the east-west valley occupied by the west fork and the east branch, the principal tributaries of the San Gabriel River.

The dam site is located in the narrowest point of the main San Gabriel Canyon between the Sierra Madre and the San Gabriel faults, being about 2 miles from the former and 5 miles from the latter.

The rock at the site is mainly a granodiorite gneiss, which in places becomes dark or hornblendic and thus grades into a rather basic diorite gneiss. Associated with this gneiss are irregular masses of aplite and diabase dykes. Numerous insignificant faults, shear planes and joints exist in the dam site, but there is no evidence of recent movement. In fact, lack of displacement in the stratification of old streambed gravels establishes the fact that there has been no material motion in a period of the order of ten thousand years. One such minor fault intersects the dam foundations near the base of the right abutment in a direction nearly normal to the axis of the dam. This fault has been made the subject of special treat-

FIG. 1—MORRIS DAM will store 39,300 acre-ft. on the San Gabriel River, to augment the water supply of Pasadena, Calif. The concreting plant and the head tower for the cableway-placing system are shown between the dam and spillway.



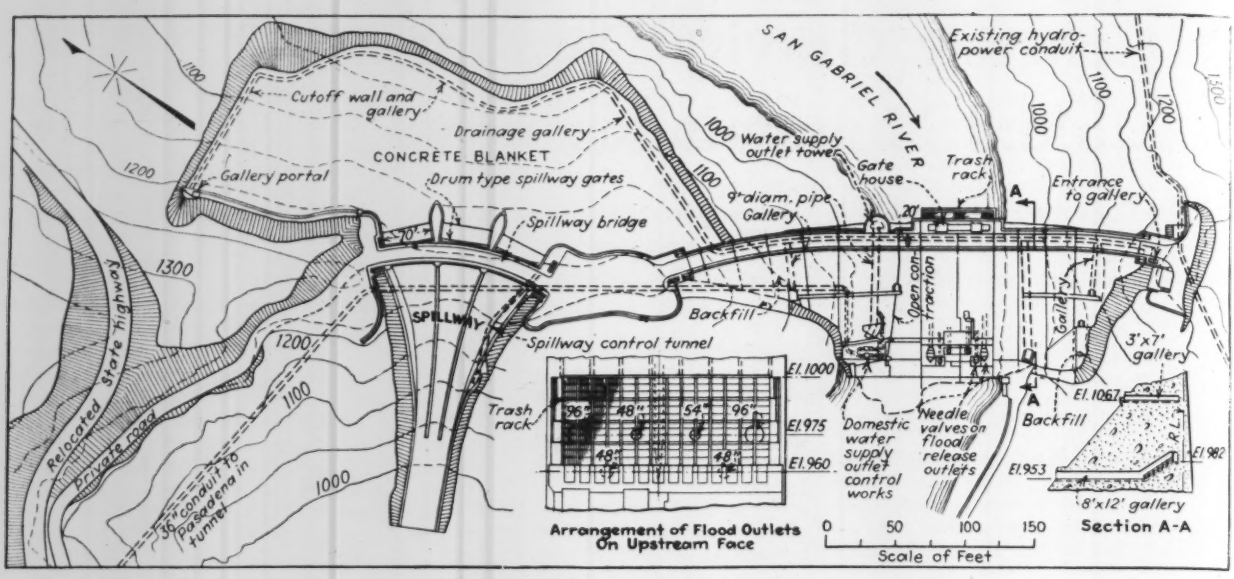


FIG. 2—GENERAL LAYOUT of dam and spillway, showing extensive area of concrete blanket on the slope on the upstream side of the spillway.

ment, which has been described later in the article.

Exploration of the site

Probably more thorough exploring and testing of the Pine Canyon Dam site was done prior to completion of plans than has been done for any other dam. The general character of rocks in the San Gabriel Mountains and the large overburden of decomposed rock on the abutments and deep gravel deposits in streambed demanded great thoroughness.

The major part of the exploratory work was done by driving small tunnels and sinking shafts. Altogether, 23 tunnels, with a total length of 2,760 ft., were driven into the abutments, including one tunnel that was driven across the canyon below streambed. As an aid in exploration, the first half mile of the main outlet tunnel was driven into the right abutment. There were seven shafts sunk an aggregate of 520 ft. Diamond core-drilling consisted of eleven holes for a total footage of 875. Altogether there were 4,155 ft. of exploration tunnels, shafts and diamond core-drilling, in addition to the driving of the half-mile outlet tunnel.

Later excavation of foundations and abutments revealed the sufficiency of the exploration work, and no materal relocation or redesign of the dam has been necessary on account of unforeseen conditions. Some of the exploration tunnels are being permanently left open for drainage or inspection.

Design of Morris Dam

Consideration was given to all types of design, and several designs and estimates were prepared before the final adoption of a straight gravity concrete dam as the type best adapted to the topographic and foundation conditions, with proper considerations of economy.

Weight of concrete was assumed to be 150 lb. per cu.ft. Actually test specimens cut from the dam have weighed 155 lb., and 14x28-in. compression cylinders made in the laboratory with full-sized aggregate have weighed 157 to 158 lb.

Uplift was considered as varying from 100 per cent at the upstream face to 50 per cent at the line of drains, just upstream from the galleries, and then diminishing uniformly to zero or backwater pressure at the downstream toe; all considered as acting on 100 per cent of the area. The foundations near the upstream face of the dam are grouted through a double line of grout holes in the deep cutoff trench, staggered 5 ft. apart and 30 ft. in depth. In addition, 150-ft. grout holes have been driven in the cutoff trench at about 20-ft. intervals.

Drainage holes are provided in the dam on 10-ft. centers, and extend 30 ft. into the foundation rock. In the right abutment, drainage wells extend from the cutoff trench to an intersection with the gallery at El. 960 that drains the concrete lining on the right abutment spur.

Earthquake-resistant design

The dam has been designed to resist an earthquake shock with an acceleration of one-tenth gravity. In addition to the inertia effect of a force of one-tenth the mass of the dam, acting horizontally through the center of gravity of the portion of the dam under consideration, there is the hydrodynamic effect due to the dam oscillating against the still water in the reservoir. Prof. H. M. Westergaard, University of Illinois, was the first to analyze this force successfully, the existence of which had been pointed out by H. O. Wood, seismologist, Carnegie Institute at Pasadena. The amount and existence of this force was further verified by model tests on the shaking table at Stanford University by Prof. Lydik Jakobsen.

The natural period of vibration for Morris Dam as a whole has been calculated as being 0.16 sec. or less. The more destructive earthquakes are usually the ones with fairly large amplitudes and longer periods, and the smaller temblors are usually associated with the shorter periods such as this. Also there is plenty of evidence that earthquakes do not have a constant period of vibration, even for a short period of time, so that the probability of resonance to any degree seems remote.

As to vertical acceleration, it has been shown that this has no overturning effect upon a dam, because the weight of the dam and water are both effectively changed at the same time in the same proportion. The vertical acceleration does, however, cause a slight effect upon the unit stresses.

The effect of the conservative assumptions of uplift and the inclusion of earthquake forces are shown by the adopted cross-section of the dam, which has an upstream batter of .05 to 1 and a downstream slope of .81 to 1, or a base width of 0.86 *h* for the straight section of the dam. The dam contains about 15 per cent more material as a result of this thickening to resist earthquake forces.

Treatment over fault

The fault near the base of the right abutment dips into the hillside at an angle of about 60 deg. NW and has a strike nearly perpendicular to the axis of the dam. The striations on the fault, whether in the oldest decomposed rock near the surface or in the fresh rock at depth, are all in the same direction, dipping about 60 deg. downstream, indi-

cating that the direction of fault movement has always been about the same. As has been previously stated, lack of displacement of old streambed gravels indicates that there has been no movement in the fault for a period of probably 10,000 years.

Over the trace of the fault an open joint has been provided with vertical sliding planes from bottom to top of the dam between blocks 8 and 9. These vertical sliding planes are four in number, at an angle of nearly 45 deg. to the horizontal, and lie in the direction of resultant motion as shown by the strike, dip and striæ on the fault. Planes of contact are separated with a bituminous filler which can yield if motion is slightly at variance from the predetermined direction. Between the vertical sliding planes are 3-ft. open spaces extending the full height of the dam. The maximum motion accommodated is 6.55 ft. in either direction along the striæ or direction of motion.

During such maximum earth motion the open space between the adjacent blocks will be either closed to zero or opened to 6 ft. from the present width of 3 ft. Accordingly, the blocks adjacent to this joint have been designed to carry an additional water load of 6 ft.

Other factors met

To fit the topography of the site better, the abutment sections are curved to a radius of 716.3 ft. Consideration was given to the effect of converging radii upon the stability of the curved sections, which were accordingly made thicker than the straight sections. The upstream batter is the same .05 to 1, while the downstream slope was increased to 0.875 to 1 above El. 970 and 0.95 to 1 below that elevation. Arch action was not considered, because of the fault located along the base of the right abutment.

Contraction joints are generally at 50-ft. intervals but have been adapted to fit topographic conditions best. The narrowest block is 25 ft. wide. The usual copper water seals in 8-in. wells, 2 ft. 4 in. from the upstream face, are provided at the contraction joints.

To reduce sliding factors, the 5-ft. lifts of concrete were placed on a 10 per cent grade upward in a downstream direction. For 10 ft. from the upstream face the grade is reversed to provide a clean-up trough 10 ft. back from the upstream face.

Water-supply outlets

The outlet tower was completely redesigned after the city of Pasadena entered into an agreement with the Metropolitan Water District of Southern California to sell the Morris Dam and Reservoir for the district's use in storing Colorado River water when this supply is available for distribution to Pasadena. The semi-circular outlet tower as redesigned has eighteen 2x8-ft. slide gates connected with 3½-in. stems and operated by hydraulic cylinders at the top of the dam. These gates are placed in pairs at 19¼-ft. differences in elevation, with the sill of the lowest gate at El. 1000. Semicircular removable screens in about 10-ft. sections, four sections to the gate, will be lowered in front of the particular outlets in service.

A 9x9-ft. slide gate at the outlet of the tower affords emergency control over a 9-ft.-diameter outlet pipe; until used by the Metropolitan Water District, this 9-ft. pipe terminates at the downstream face of the dam. From the end of this outlet, a 42-in. pipe takes off for Pasadena's use. Needle valves regulate the release of water into the 18½-mile, 36-in.-diameter, welded steel pipe line to Pasadena.

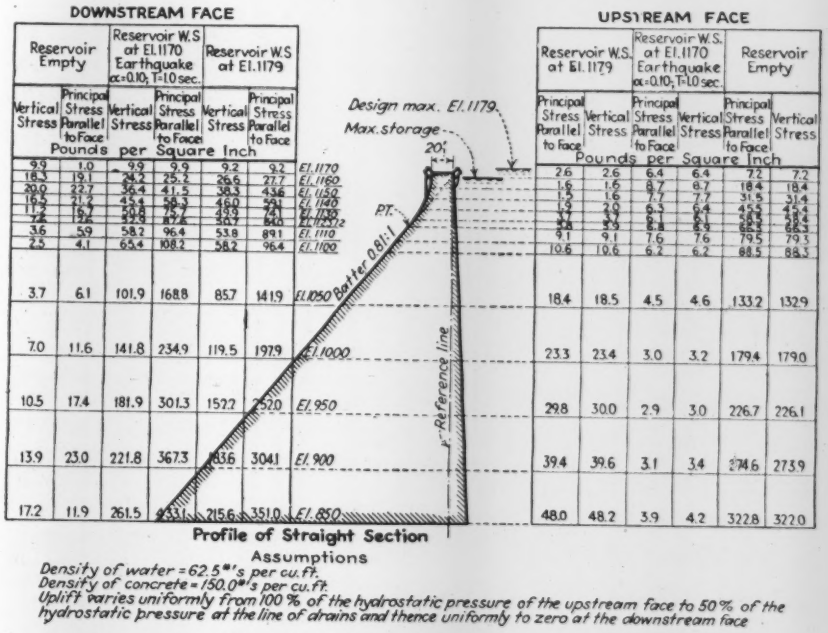

DOWNSTREAM FACE
Reservoir Empty
Reservoir W.S at El.1170 Earthquake α=0.10; T=1.0 sec.
Reservoir W.S at El.1179
Vertical Stress
Principal Stress Parallel to Face
Pounds per Square Inch
UPSTREAM FACE
Reservoir W.S. at El.1179
Reservoir W.S. at El.1170 Earthquake α=0.10; T=1.0 sec.
Reservoir Empty
Design max. El.1179
Max. storage
20'
P.T.
Batter 0.81:1
Reference line
Profile of Straight Section
Assumptions
Density of water = 62.5 #'s per cu.ft.
Density of concrete = 150.0 #'s per cu.ft.
Uplift varies uniformly from 100 % of the hydrostatic pressure of the upstream face to 50 % of the hydrostatic pressure at the line of drains and thence uniformly to zero at the downstream face

FIG. 3—STRESS ANALYSIS for maximum section, showing increases resulting from earthquake force of 0.1 g.

Flood-release outlets

Six flood-release outlets, with one common trashrack structure of 3,160-sq.ft. net area on the upstream face of the dam have a maximum capacity, reservoir full, of nearly 7,000 sec.-ft. While the existing river channels downstream from the dam do not afford percolation area sufficient to absorb a flow greater than 650 sec.-ft., subsequent improvements may greatly increase this capacity.

The Los Angeles County Flood Control District has plans to create large spreading grounds to increase percolation. Also, it may be necessary, at times, to release large flows to break up the streambed gravels that tend to become sealed from conditions of low regulated streamflow.

At El. 975 there is one 54-in. and one 48-in. outlet for normal release of floodwater, each equipped with venturi meters, and two 96-in. outlets for occasional large release. At El. 960 there are two 48-in. outlets for the primary purpose of sluicing any silt from beneath the other four flood-release outlets.

Each of the outlets is equipped with a free-discharge, hydraulic-balanced, needle valve at the downstream face of the dam, to be used for normal operating conditions. In a gallery near the upstream face the 54-in. outlet and each of the 48-in. outlets is equipped with hydraulically operated slide gates for emergency use. The 96-in. valves are similarly equipped with electrically operated butterfly valves for emergency use.

As a final precaution, in case any of the emergency valves themselves should need attention, an 8 x 10-ft. tractor gate has been provided on the upstream face of the dam. This gate is operated by a 100-ton traveling hoist located in a hoist house at the crest of the dam. Each of the several sized outlets has a mouth belled to an 8x10-ft. gate frame to fit the tractor gate leaf.

Spillway

The spillway was designed to discharge 80,000 sec.-ft., or twice the maximum recorded flow. Three automatic, floating-drum-type spillway gates, hinged downstream, were installed. They are of all-welded steel construction. Each gate is 70 ft. long and 18-ft. high. The spillway was located about 200 ft. west of the west abutment of the dam over the spur that comprises the west abutment, and the channel was located in a slight draw or ravine on the downstream side of that spur. The draw is so shaped that if the spillway channel

were run full width all the way down the hill, there would be excessive excavation at the channel side walls, so it was decided to converge the spillway channel side walls from 210 ft. at the crest to 50 ft. at the discharge lip.

Several models were made on a scale of 1:48 to assist in determining the best design. The adopted coefficient of discharge is 3.45. It was evident that there was a distinct advantage in putting the gates on chords of an arc, giving the water through each gate a start in a direction that would necessitate the least possible amount of deflection. If the correct lines of flow are affected initially, they do not have to be changed, or, if done near the top where the velocities are low, they may be changed more easily than down the channel, even a short distance, where the water is beginning to attain quite a high velocity.

Vertical side walls were found to keep the water within the channel better than would sloping side walls. Further, vertical walls were better suited to cantilever-wall construction. In a converged channel, when one end spillway gate only is discharging, the water has a tendency to follow its initial direction and jump the opposite side wall near the bottom. To control this, center walls down to El. 1014 were put in to keep the water from each gate in its own particular part of the channel. These walls were very successful and were put in to the necessary height and length downstream to accomplish the desired result, as determined by the model experiments. According to the model study, at an 80,000-sec.-ft. discharge, the freeboard near the top is about 5 ft., where the velocities and depths cannot vary much from the computed or observed, and it gradually increases until at 150 ft. downstream the freeboard is 10 ft. where the stream may be more inclined to flutter. The model tests showed the length and shape of the bridge piers that extended upstream from the spillway bridge had a very marked effect in controlling wave action in the spillway channel throughout its length.

A model to a 1:240 scale, representing about ½ mile of channel, was also constructed to determine the proper elevation and dimension of the spillway discharge lip to cause minimum scour below streambed. The spillway lip adopted is a cantilever structure substantially at streambed level 800 ft. downstream from the dam and discharging upward at a gradient of 40 per cent.

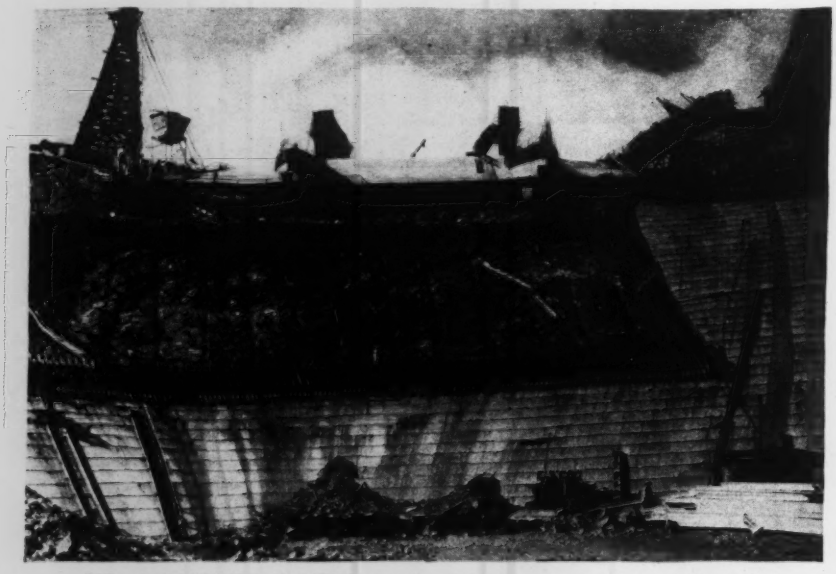


FIG. 4—CONCRETE BLANKET on the slope upstream from the spillway is placed to prevent percolation through the unsatisfactory rock of this hillside spur.

The floor of the spillway was poured monolithically and directly on rock with a specified average thickness of 2 ft., which overran considerably because of the irregular surface of the rock. The floor is reinforced against temperature stresses with 0.3 per cent steel in each direction. The floor is anchored into the rock by 1-in. square bars at 6-ft. centers. Weep holes are provided at 6-ft. centers.

Hill paved with concrete

The right abutment of the dam is a rather narrow spur of the mountains around which the river makes nearly a 180-deg. bend. It was thought advisable, on account of the fractured condition of some of the granitic rock composing the hill, to line or pave the upstream side of this spur to prevent the percolation of water into the hill. The extent of the paving is shown in Fig. 4.

The slab was designed to be 2 ft. thick at the bottom of the hill and to decrease gradually to a 1-ft. thickness at the top. Actually, it was much thicker than this, owing to irregularities in the rock. It was fully reinforced with 0.3 per cent of hard-grade reinforcing steel both ways to prevent temperature cracks. The concrete was poured in 5-ft. lifts, and calking joints or grooves 2 in. wide by 4 in. deep were left for final calking with dry mortar; this was tamped in with air hammers after the slab concrete had set and cooled.

The slab is underdrained with continuous 4-in. round tile drains set in ditches in the rock and surrounded with gravel. The drains run down the slope in the steepest direction. They terminate at the lower end in a drainage tunnel or gallery formed in the concrete of the cutoff trench along the lower edge of the lining. This gallery drains the water to the downstream face of the dam. The 4-in. drains, in general, are not interconnected and were laid on as nearly a straight line as possible so that they may be rodded out, or so that any leakage that may develop in the slab can be located, and if necessary can be sealed by grouting.

Special investigations

Special studies are being carried out which need not be discussed in detail, but it is hoped that they will lead to additional information upon the distribution of stresses in large concrete gravity dams. Seven uplift cells were placed on the contact line between concrete and the lowest part of the rock foundations. Other uplift cells were placed within the concrete itself. Resistance thermometers were placed in the rock beneath the contact line and within the mass concrete.

A large number of Carlson strain gages have been placed throughout one block 50 ft. above bedrock and about 100 ft. above bedrock. Several strain meters have been encased in blocks of concrete in the interior mass free from the surrounding mass concrete for comparison with those under stress. Through cooperation with the Bureau of Reclamation, cement and aggregate have been shipped to Denver, where a number of concrete blocks with embedded Carlson strain meters are being subjected to the same time-loading conditions as those in the dam, in an attempt to distinguish between flow of concrete and stress.

Glass tubes with silvered interior have been developed for use in determining the depth of cracks formed in the mass concrete. By embedding these 5-ft. glass tubes at varying depths where cracks the likely to occur it is planned to detect the existence of cracks by the broken silver lining opening an electric circuit.

Photo-elastic studies of intensity and distribution of stress by use of polarized light and thin bakelite sections of the dam and foundations were made by J. H. A. Brahtz under supervision of Prof. Dr. Theodore von Karman at the California Institute of Technology. These studies will be compared later with mathematical analyses, the strain studies being made on the dam itself, and deflections as determined by the use of a precise theodolite.

The cost of the Morris Dam is about

$4,750,000, and the total cost of the entire project is about $7,500,000.

Personnel

The San Gabriel development, including design and construction, is under the immediate charge of S. B. Morris, chief engineer and general manager of the Pasadena Water Department. The consulting engineers, all of Los Angeles, are Louis C. Hill, the late Fred A. Noetzli and A. L. Sonderegger; Frederick L. Ransome is consulting geologist. Claude W. Sopp, assistant engineer, is responsible for the hydrographic studies, Cecil E. Pearce was the designing engineer, Ross White construction engineer and Verne L. Peugh resident engineer. During the last eight months of the job Mr. Peugh served as construction engineer, and R. W. Spencer served as resident engineer.

H. Stanley Bent was general manager for the contractors, Bent Brothers Inc., Winston Brothers Co. and Wm. C. Crowell. The general superintendent was L. T. Grider, and E. W. Whipple was assistant superintendent.

Roadside Planting in Texas a Regular Maintenance Task

Landscaping, using the native plants, planned to serve the triple purpose of esthetics, recreation and driving safety

By Allen P. Child
Kansas City, Mo.

TEXAS, with its wide areas, great road mileages and many climates, was one of the first states to take up on a large scale the systematic beautification of its highways through long-time plans for roadside improvement. These plans have been worked out to give pleasure to the users of the highway and to increase safety in driving.

The preservation of natural beauty spots is one of the first considerations of the Texas plan; wherever there are particularly beautiful views of mountains, lakes or valleys, the view is to be made available to the motorist by leaving spaces or openings between roadside trees.

The use of straight rows of trees is being avoided in planting operations along the highways, and preference is being shown to small groves or clumps that are being developed in advantageous positions. Linking these groves together will be individual trees.

Intersections and curves

At road intersections sufficient clearances are to be left unplanted so that complete visibility may be assured at all times to cars traveling from opposite directions. To further the idea of making these plans serve in increasing the safety of driving, the inside of curves along the highways will be left unplanted so that greater visibility of oncoming cars is obtained. Also outside curves of the highways will be set out with trees so that the motorist obtains an idea of the direction that the road takes. To warn the driver of the road direction over hills, the highway department is setting out trees along hilltops, and by the direction that the tops of the trees take the motorist knows whether the road goes straight ahead over a hilltop or whether it turns to the right or left.

In the arid western reaches of the state many ingenious uses of native plants are being resorted to, to relieve the monotony of long straight stretches of highway. Behind every sign of caution and information one of the graceful yucca plants has been set out. All approaches to the guard-rail sections, bridges and culverts are being beautified with plantings of trees and shrubs.

To care for pleasure driving, the department is planning to provide a large number of small parks at frequent intervals along the highways. Tourists may turn off in safety at these small parks, where they will find tables and benches handy for lunches or rest in the shade of the trees. Also wild-flower seeds by the hundreds of pounds have been planted along the roads where the flowers can be readily seen from the passing cars.

Proper care of the young trees set out as well as the more mature plants is part of the duty of the regular road-maintenance crews. In the arid regions of the state, tank trucks carry water for the proper watering of the plants. In every section over the state there is friendly rivalry between the maintenance crews in the upkeep of the new plantings.

FIG. 1—TYPICAL UTILIZATION of clumps of trees to provide resting places and conveniences for eating luncheon.

FIG. 2—ARID-PLAINS planting of native plants. Planting is confined to outside of curve so as not to reduce sight distances.

Digestion Rates of Mixed Sludges Shown by English Experiments

Three years' research completed on the digestion characteristics of activated sludge alone and when mixed with primary tank sludge

A THREE-YEAR PROGRAM of research on the digestion of sewage sludge has recently been completed at the Davyhulme Works of the city of Manchester, England, and the conclusions of the experimenters are summarized in the annual report for the year ending March 31, 1934, of the Rivers Department of that city. Briefly stated, the conclusions are that activated sludge alone involves difficulties in digestion, but that digestion proceeds under favorable conditions when 15 per cent of primary-tank sludge is added. The following notes have been taken from that report.

The experimental plant consisted essentially of two covered digestion tanks, each of 3,220-imperial gallons capacity (3,864 U. S. gallons), fitted with a hot-water circulation system with thermostatic control, whereby sludge could be digested at temperatures of 25-30 deg. C. and 50-55 deg. C. respectively. The main investigation carried out in the course of the research related to the digestive processes of the following sludges:

1. Equal volumes of tank sludge and activated sludge.
2. Activated sludge alone.
3. Activated sludge plus about ten per cent by volume of tank sludge.
4. Activated sludge plus about 15 per cent by volume of tank sludge.

At first the "batch" system of operation was employed, but later trials demonstrated that the "daily addition" method of operation was preferable by reason of simplified manipulation, an accelerated rate of digestion and a more regular evolution of gas. In the accompanying table are summarized the results obtained when each of these mixtures of sludge was being dealt with satisfactorily and regularly at the maximum rate of digestion as determined by experiments.

The whole aim of the research was to determine the minimum digestion period required to yield a sludge that could be finally dealt with on land without fear of nuisance; consequently the figures do not show the total gas yield possible. It is believed, however, that they represent from 70 to 80 per cent of what could possibly be obtained if the digestion period had been greatly extended.

The "water" withdrawn from the heated digestion chambers generally contained appreciable amounts of suspended solids, and the liquors had a high content of oxidizable matter. In the trials with "equal volume" mixtures of sludge, the withdrawn water was wasted without pretreatment, whereas in all the other trials it was subjected to settlement over night before running it to waste, and the sludge deposited therefrom was returned to the digestion tanks.

In the calculations of the detention period, allowance has been made for the time required to digest properly the partly digested solids that escaped in the top water withdrawn from the chambers.

The data shown relating to the further digestion of digested sludge are the average results of several experiments carried out on samples of digested sludge (about 300 gal. each) obtained during the progress of the experiment.

The principal findings of the three-year research program are summarized as follows:

1. That the digestion of equal-volume mixtures of activated sludge and tank sludge can be carried on satisfactorily at 25-30 deg. C. and that mesophilic digestion is preferable to thermophilic digestion at 50-55 deg. C. for this type of sludge mixture.

2. That the digestion of activated sludge alone is unattractive, mainly on account of the low gas yield; but also,

SUMMARY OF RESULTS, 1931-34,
DAVYHULME WORKS DEMONSTRATION SLUDGE-DIGESTION PLANT

	Mesophilic Digestion 25-30 deg. C.				Thermophilic Digestion 50-55 deg. C.			
	Equal Volume Mixture of Activated Sludge and Tank Sludge	Activated Sludge Alone	Activated Sludge + 10% by Volume Primary Tank Sludge	Activated Sludge + 15% by Volume Primary Tank Sludge	Equal Volume Mixture of Activated Sludge and Tank Sludge	Activated Sludge Alone	Activated Sludge + 10% by Volume Primary Tank Sludge	Activated Sludge + 15% by Volume Primary Tank Sludge
Vol. of activated sludge, on the basis of 98% water, treated per day, Imp. gal.	127	361	374	379	126	683	722	763
Vol. of primary-tank sludge, on the basis of 88% water, treated per day, Imp. gal.	107	Nil	39	66	105	Nil	74	114
Ratio—volume of activated sludge: volume of tank sludge	1.2 : 1	.....	9.6 : 1	5.7 : 1	1.18 : 1	.....	9.8 : 1	6.7 : 1
Ratio—volatile matter activated sludge: volatile matter tank sludge	0.22 : 1	.....	1.80 : 1	1.03 : 1	0.22 : 1	.....	1.79 : 1	1.39 : 1
Actual volume of fresh sludge treated per day (input), Imp. gal.	240	234	330	396	230	514	648	632
Water content of (input sludge), per cent	93.25	97.44	96.34	95.96	93.27	97.36	96.33	95.33
Volatile matter in dry solids of input sludge, per cent	57.24	69.04	66.19	66.17	57.32	69.67	66.89	61.67
Volatile matter input sludge added per day, lb.	97.5	42.4	85.4	110.1	95.6	97.1	165.0	190.4
Gas yield per day, cu. ft.	371	161	357	577	340	390	742	979
Gas yield per lb. volatile matter input sludge, cu. ft.	3.80	3.81	4.18	5.24	3.56	4.01	4.50	5.14
Volume of water separated and run to waste per day, Imp. gal.	97	103	47	32	103	243	135	87
Dry solids content of water separated, per cent	4.39	.31	.27	.20	2.06	.88	.41	.44
Volume of digested sludge withdrawn from digestion tank, Imp. gal.	145	127	277	357	124	229	482	529
Water content of digested sludge, per cent	93.72	97.60	97.00	96.81	90.31	97.71	96.55	95.82
Volatile matter, in digested sludge, per cent	47.21	59.35	56.50	57.96	46.49	61.84	56.75	53.75
Detention period, calculated from total of volumes given in first two items, days	.....	10.7	7.8	7.1	.....	4.8	4.0	3.7
Detention period, based on actual volume input sludge (fifth item), days	15.0	13.8	9.8	8.1	15.0	6.3	5.0	5.1
Ratio—gas yield per day: capacity of digestion tank, cu. ft.	.74 : 1	.32 : 1	.71 : 1	1.15: 1	.68 : 1	.78 : 1	1.48 : 1	1.96 : 1
Lb. volatile matter fresh sludge treated per day per cu. ft. digestion tank	.195	.085	.171	.220	.191	.194	.330	.381
pH (average)	7.8	7.6	7.6	7.8	7.8	7.9	8.0	8.0

	Secondary Process *Second stage digestion: Atmos. Temp.*		Secondary Process *Settlement only*	
Aver. water content of digested sludge submitted to further treatment, per cent.	93.69	96.41		95.80
Aver. volatile matter digested sludge submitted to further treatment, per cent.	49.11	57.41		54.22
Volume of water decanted after secondary process		44		45
Dry-solids content of water decanted		.21		.53
Volume of densified digested sludge remaining and passed to drying beds		56		55
Water content of densified digested sludge		94.25		92.82
Volatile matter of densified digested sludge		55.40		52.79
Detention period—secondary process		10.5		6.5
Drying beds:—lb. dry matter per sq. ft. of bed (Direct to beds—Winter conditions)		2.1		2.6
Time taken for drying, days (Direct to beds—Winter conditions)	45	35		41
Water content of dried sludge, per cent	71.30	69.51		70.31

in the case of digestion at 25-30 deg. C., by reason of the difficulty of maintaining the optimum pH of the digesting sludge.

3. That the addition of 10 per cent by volume of tank sludge to activated sludge improves matters considerably by increasing the gas yield, but in case of digestion at 25-35 deg. C. complete stability of the reaction of the digesting mass cannot always be ensured.

4. That if the proportion of tank sludge be increased to 15 per cent by volume, the digestion of activated sludge presents no difficulty, the gas yields show a further substantial increase, and the satisfactory pH of the digesting sludge is ensured.

5. That owing to the short period of digestion it is not practicable to remove directly any sensible proportion of water from the heated tank, and, therefore, further treatment is required for separation of water and reduction in the bulk of the sludge to be finally dealt with. In the case of mesophilic digestion, 10 to 20 days' further detention in tanks at atmospheric temperature is sufficient to effect a good separation of water; the amount of additional digestion of sludge is not very material, but there is a definite lowering of the organic matter content of the sludge. Separation of water from sludge digested at 50-55 deg. C. is more readily effected, five days' settlement generally being sufficient.

Unusual Skew Arch Designed with Stiffening Ribs and Thin Barrel

SKEW-ARCH BRIDGE in which barrel slab, arch ribs and spandrel ribs comprise a single structural unit.

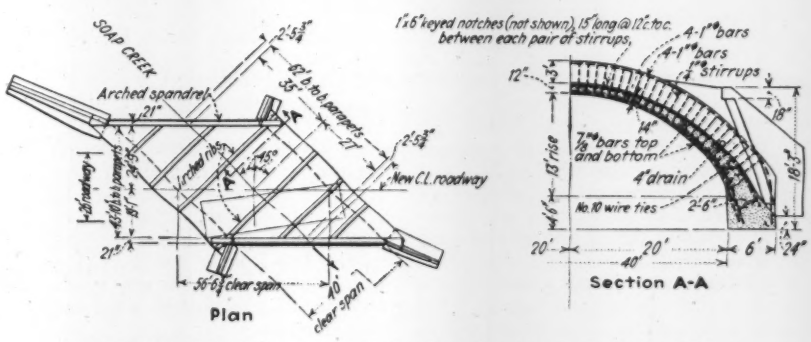
A REINFORCED - CONCRETE skew-arch bridge having unusual features was completed recently in Lee County near Keokuk, Iowa. This bridge has a clear span of 40 ft. perpendicular to the channel, a width out to out of 47 ft. 4 in., and a 26-ft. roadway. The skew is 45 deg. Although the structure appears to be an ordinary solid barrel arch, it actually is constructed with a relatively thin slab stiffened by ribs placed at right angles to the channel. The two center ribs are complete arches extending from foundation to foundation. The two outer ribs on each side are part arches, with one end supported by the foundation and the other framed into and supported by the spandrel wall, which itself is constructed as a complete arch rib.

This novel slab and rib arrangement was adopted mainly for the purpose of obtaining a structural layout that was subject to a fairly accurate and yet simple analysis of stresses. The center ribs were designed as complete arches, while the outer ribs were assumed to act as curved beams. The spandrels, in turn, were designed as complete arches.

In order to make sure that the actual structural behavior would correspond fairly closely to the above assumption, it was necessary to make the arch slab thin in relation to the depth of the ribs. The arch-slab thickness therefore was made a minimum of 12 in. at the crown section, increasing to 2 ft. 6 in. at the springing line. As shown in the accompanying sectional view, the web of the center concrete rib extends 3 ft. above the top of the arch slab, while the corresponding web depth is 2 ft. 6 in. for the outer ribs. The total depth of the spandrel wall varies, the minimum depth at the center being 3 ft.

The wingwalls are separated from the main structure by vertical expansion joints with a ½-in. joint filler.

This bridge was designed by the Iowa state highway department under the direction of E. W. Blumenschein, bridge engineer, and constructed by the Lee County bridge department.



PLAN AND SECTION of unusual framing of concrete-arch bridge in Iowa.

Demolition Results in Chicago

More than two-thirds of the city of Chicago has been inspected for buildings that are beyond repair. Of 5,384 in the questionable class 3,292 are beyond repair. Of these the state housing board has destroyed 235 and has the owner's consent to raze 48 others. The West Central Association has demolished 33 and has 10 consents pending. Mayor Kelly's committee on substandard housing reports 170 down and 61 about to be demolished. To this total can be added 485 houses wrecked by owners and 301 repaired by owners. Thus 1,343, or nearly 25 per cent of the listed structures, are now removed from the questionable classfication. The Metropolitan Housing Council, which has been pushing the demolition program, is now working on repairable buildings. It has recently initiated a land-use survey, utilizing relief workers. Coleman Woodbury has been appointed survey director. He is now drawing up the necessary schedule of questions and is being assisted by Charles Newcomb, who is loaned by the Federal Census Bureau.

Book Reviews and Notes

A Monthly Commentary on Current Additions to the Civil Engineer's Library

Engineering Cost Accounting

A TREATISE ON ENGINEERING BUSINESS PRACTICE RELATIVE TO THE DETROIT ADDITIONAL WATER-SUPPLY PROJECT—By Edward W. Frey. Paper; 9x11 in.; pp. 134. A limited number of copies have been published by the Department of Water Supply, Detroit, Mich.

IN THIS TREATISE there is presented a detailed description of the cost-accounting system inaugurated on the additional water-supply project for Detroit at the very beginning of operations, to prevent if possible disputes between the city and contractors. The whole story of the inception, planning and construction of the project is contained in Part I of the book, and in Part II, which is the real reason for publication of the book, detailed attention is given to departmental accounting, journal register, construction-cost ledger, time and payroll records, invoice and payment record, contract ledger, estimates on progress payments, annual cost report and contract cost-accounting. As all of the contracts contained a provision for taking over the work in case of default by the contractor, the water department maintained a "contractor's cost record," which gave it a continuous reasonable knowledge of the contractor's work.

How Utilities Can Be Regulated

PUBLIC UTILITY VALUATION FOR PURPOSES OF RATE CONTROL—By John Bauer and Nathaniel Gold. Cloth; 6x9 in.; pp. 477. Published by The Macmillan Co., New York. $3.50.

This analysis of the problem of public-utility regulation will be found of interest in these days when so much is said about the breakdown of our system of utility regulation and the possibility of supplanting it by "yardsticks" in the form of publicly owned and operated power plants. The book is written from the viewpoint of those who have represented the public in efforts to reduce utility rates, and its approach to the subject is summed up in the authors' statement that the basic defects of the present system have been greatly accentuated in the period since 1929 when there has been extraordinary need for prompt utility-rate adjustments in line with the shift in economic conditions, falling prices and vast shrinkage in the purchasing power possessed by the masses of people. The authors clearly set forth the defects of our present system and state what, in their opinion, is needed to put valuation on a basis that will permit effective administration of regulatory laws. The book is one of a group published under the auspices of the Columbia University Council for Research in the Social Sciences. The first volume, "Stock Watering," was published in 1930, a volume on the law of eminent domain is soon to be published, and the research as a whole will be summarized in a book on the valuation of property by James C. Bonbright, editor of the series.

Planning Laws

MODEL LAWS FOR PLANNING CITIES, COUNTIES AND STATES—Vol. VII, Harvard City Planning Studies. By Edward M. Bassett, Frank B. Williams, Alfred Bettman and Robert Whitten. Cloth; 7x10 in.; pp. 137. Published by Harvard University Press, Cambridge, Mass., $2.50.

Laws relating to zoning and planning for cities, counties and states have been developing so rapidly in recent years that information as to what form such laws should take in order to benefit most from the results of past efforts to develop effective laws is scattered and difficult to find. The present work is intended to bring that information into convenient form for the benefit of planners, legislators and others who have to do with the preparation of laws relating to planning and zoning. No attempt has been made to lay down a hard and fast model law, but alternate forms are given, together with discussions of points upon which there are divergent opinions.

City Government

Reviewed by M. N. Baker
Upper Montclair, N. J.

CITY GOVERNMENT IN THE UNITED STATES—By Charles M. Kneier. Cloth; 6x9 in.; pp. 482. Published by Harper & Brothers, New York and London. $3.

PROFESSOR KNEIER'S book deserves welcome as a well-balanced, up-to-date, fully documented review of municipal government in this country, "as a problem in democracy." As a background the author takes up the growth of cities, political consequences of urbanization, municipal home rule and both state and federal relationships. He then considers municipal powers and liabilities, nomination and election of officials, political parties and the invisible government that is a matter of such grave concern. There are chapters on those intended safeguards of democracy, the initiative, the referendum and the recall, and on the more subtle and uncertain influence of public opinion.

Particularly well handled are the chapters on the three main forms of city government currently practiced in the United States: the mayor-and-council, the commission and the commission-manager plans. The advantages of the latter are well set forth.

Only one chapter is devoted to administrative organization and operation—not that the author belittles their importance but because they demand a volume for adequate treatment. After taking up the city judiciary the book closes with a chapter on the integration of local government—or its lack of integration, with consequent overlapping, inefficiency and wastefulness of effort and money.

In design and execution the book is well suited to the general reader and for school and college study. The index is commendable.

Ancient Roads

NOTES ON THE HISTORY OF ANCIENT ROADS AND THEIR CONSTRUCTION—By R. J. Forbes. Cloth, 7x10 in.; pp. 182; line drawings and tables. Published by the Secretariat, Allard Pierson Stichting, Weesperzijde 33, Amsterdam, Holland. Price 4.90 florin.

AS A SOURCE BOOK for some future narrative history of ancient roads, this volume performs a distinct service. The author perhaps had this purpose chiefly in mind when he modestly designated his studies as notes and later on expressed the hope that they will help "to make possible the writing of a true history of ancient roadbuilding." For its extensive bibliography of writings on ancient roads, its chronological tables, its maps of ancient road systems and its drawings of road structures as disclosed by excavations, the book has a reference value that places it among the notable contributions to highway literature.

Passing the chapters in which the road is considered as merely a selected travel route of connecting passes and valleys and later as a defined path somewhat improved by human agency, interest in road structure begins with the log roads of Holland, Sweden, Poland and other swampy regions of Europe. Remains of such roads date back to 2500 B.C. The author then in several chapters discusses the roadbuilding of Malta, Crete, Egypt, Palestine, western Asia and Persia, India and Greece, bringing the record up to the great roadbuilding era of the Roman Empire. To this last roadbuilding era the author devotes some 40 pages. The headings under this division are: (1) origin of Roman roadbuilding, (2) development of Roman road system, (3) Roman road construction and road materials, (4) Roman streets, (5) control and financing of Roman roads, and (6) Roman and modern road construction compared.

In reviewing this book the temptation

to quote is often presented. To find materials used and construction devices practiced one and two thousand years ago, that are now common, is a frequent surprise to the reader. These interesting details, however, are for the reader to discover, and they require the context of the author's full narrative to be appreciated.

Hydraulics

Through inadvertence, the headings on reviews of two books on hydraulics were interchanged in the preparation of the book review pages of our issue of Nov. 22, and as a result the review of Prof. Herbert Addison's book "Applied Hydraulics" was published under the heading for Prof. Schoder's and Prof. Dawson's book "Hydraulics." To rectify that error as fully as is now possible, the review of Professor Addison's book is repeated herewith, together with comment on the second edition of the Schoder and Dawson book and on a third book on hydraulics which is now available in a fourth edition. —EDITOR.

APPLIED HYDRAULICS—By Herbert Addison. Cloth; 6x9 in.; pp. 409; photographs, tables and diagrams. Published by John Wiley & Sons, Inc., New York. $5.50.

HYDRAULICS—By Ernest W. Schoder and Francis M. Dawson. Second Edition. Cloth; 6x9 in.; pp. 429; photographs and line cuts. Published by McGraw-Hill Book Co., New York. $3.50.

TEXT BOOK ON HYDRAULICS—By George E. Russell. Fourth Edition. Cloth; 6x9 in.; pp. 447; photographs, diagrams and tables. Published by Henry Holt and Company, New York. $3.90.

ALTHOUGH it bears the imprint of an American publisher, the first of the above noted books is distinctly a British work in appearance and in treatment. The author, who is professor at the Royal School of Engineering at Giza, Egypt, has as his purpose the presentation of a compact summary of the fundamental principles of hydraulics, and of the manner in which they are applied by the engineer. In this he has succeeded admirably.

The book is divided into two parts, the first devoted to the fundamental principles of hydraulic theory, and the second to practical hydraulic applications. In the first part are included discussions of liquids and their properties, hydrostatics, flow through orifices and over weirs, flow through pipes and in channels, dynamic pressures and rotary motion. The book's second part, practical applications, takes up in order pipes and pipe systems, control of water in open channels, automatic-control devices, hydraulic turbines, pumping machinery, hydraulic transmission and storage of energy and hydraulic measurements. There follows a section devoted to examples of hydraulic problems, a number of which are worked out by the author for the benefit and discipline of the engineering student.

The British flavor is made manifest in the book's typographical treatment and also by the emphasis placed on hydraulic mechanism. Quite naturally the author's selections of illustrative examples of hydraulic practice are exclusively of British installations. The British atmosphere thus created, however, by no means impairs the book's value as a treatise on hydraulics, for either the student or the practicing hydraulic engineer.

Discussions of topics that are but lately entering widely in the thinking of the American engineer, such as the Reynolds'-number concept and the subject of hydraulic similarity, are brief but very clear.

Professors Schoder and Dawson have made many changes in and additions to their well-known textbook. In hundreds of places the text has been altered to give clearer presentations, and there are more than 30 new illustrations. Considerably more formal use has been made of Berroulli's theorem, particularly in the examples for the flow in pipes. The ordinary methods and formulas for pipe flow are treated in one consolidated chapter; a new and more general treatment of viscous and turbulent flows is presented in another chapter. The hydraulic jump and the Parshall flume are presented in a new appendix. Altogether, the book is about one-sixth longer than formerly.

The fourth edition of Professor Russell's text is the result of wide demand by teachers for the inclusion of material on hydraulic turbines and pumps. Four chapters of the new book are devoted to this topic. In general, the object of the author has been to present the fundamental principles that underlie the theory of design, operation and practical selection of turbines and pumps. At the end of the book, in an appendix, there is a general treatment of fluid flow in pipes, comprising discussions of Reynolds' number, laminar and turbulent flow, and methods for computing the resistance to the flow of fluids in general through-pipe lines.

Miscellaneous Notes on Booklets and Reprints

"A HOUSING PROGRAM FOR THE UNITED STATES" is the subject of a pamphlet published by the National Association of Housing Officials, 850 E. 58th St., Chicago, Ill. Free distribution.

"TECHNICAL PROCEDURE FOR CITY SURVEYS" is the subject of Manual of Engineering Practice No. 10, American Society of Civil Engineers, 33 W. 39th St., New York City. Price to members, 95 cents; non-members, $1.90.

"CHARACTERISTIC FIRES IN FIRE-RESISTANT BUILDINGS" are described in a pamphlet prepared by the research department of the American Fore Group of Insurance Companies, 80 Maiden Lane, New York, N. Y. The present edition is the fourth. It contains information on recent fires, including the extensive one at Birmingham, Ala., on March 10, 1934.

THE REPORT of the British Building Research Board for 1933 reviews the various researches under way at the research station. Recently published, it is available from H. M. Stationery Office, London, for 2s. 6d.

DISTRIBUTION OF SOIL PRESSURE beneath a footing is the subject of Bulletin No. 43, Agricultural and Mechanical College of Texas, College Station, Texas. The bulletins are for free distribution as long as the supply lasts.

FIRE INSURANCE CLASSIFICATIONS OF CITIES and fire losses are the subjects of Publication No. 43, Public Administration Service, 850 E. 58th St., Chicago, Ill. The pamphlet discusses the need for improved measuring schedule for fire protection. Price, 50 cents.

"CONCRETE BRIDGE DETAILS" is the subject of the latest booklet of the Portland Cement Association, 33 West Grand Ave., Chicago. Containing 48 pages, the booklet discusses abutment movements, wingwalls, bridge seats, bearings, expansion joints, prevention of seepage, wearing surfaces, hand railings, construction of approach slabs and creep in skew bridges.

THE RELATION OF PAVEMENT CHARACTERISTICS to motor-vehicle operation is considered in two pamphlets of the Iowa State College: Bulletin 119—Tractive Resistance as Related to Roadway Surfaces and Motor-Vehicle Operation; and Bulletin 120—Skidding Characteristics of Automobile Tires on Roadway Surfaces and Their Relation to Highway Safety. Copies may be obtained from the Iowa Engineering Experiment Station, Iowa State College, Ames, Iowa. No price stated.

LOADING TESTS on a steel-girder bridge with integral concrete floor are described in a 27-page report published as Bulletin No. 3 by the Oregon State Highway Commission, Salem, Ore. (limited edition). The tests were made to determine the degree of monolithic or integral action when steel-girder beams are employed in connection with a reinforced-concrete deck integrally connected thereto and to determine the transverse distribution of load concentrations effected by means of reinforced-concrete cross-beams employed as bridging. The tests showed that under live load, integral action between deck and stringers safely may be assumed, and that the concrete cross-beams are effective even along the roadway for a considerable distance on either side. Live-load deflections for the composite structure were found to be less than half as great

as if no sheer connections were used; a composite structure of this type is rated as costing less than it would if no sheer connections were used.

DESIGN AND DETAIL CHARTS for welded structural steel have been published by the Northern Bridge Co., 10 S. LaSalle St., Chicago, Ill. The charts are letter-size sheets punched for loose-leaf binders. Price on application to the company.

EARTHQUAKE-RESISTANT DESIGN recommendations for buildings, structures and tank towers are presented in a new booklet published by the Board of Fire Underwriters of the Pacific, San Francisco. Described as being intended "for the use of those who wish to take advantage of the special rate provisions of the board's earthquake tariff," the booklet is a useful compendium of modern design knowledge born of the experience of West Coast structural engineers in analyzing earthquake damage and studying earthquake action.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

AMERICAN SOCIETY OF CIVIL ENGINEERS—Index to Transactions, Cols. 84 to 99 (1921 to 1934). Cloth; 6x9 in.; pp. 188. Published by the American Society of Civil Engineers, New York.

BEHÄLTER, MASTE, SCHORNSTEINE ROHRLEITUNGEN—Vol. IX, Handbuch Für Eisenbetonbau—Fourth edition, Parts 6 to 9 with summary and index. By B. Loser, V. Lewe, A. Kleinlogel, J. Hingerle, E. Marquardt. Paper; 7x11 in.; pp. 401 to 720. Tables, diagrams and photographic illustrations. Published by Wilhelm Ernst & Sohn, Berlin, Germany. Price, Parts 6 to 8, 5.50 RM; Part 9, 7 R.M.

DIRECT-CURRENT MACHINERY—Royce G. Kloeffler, Jesse L. Brenneman, Russell M. Kerchner. Cloth; 6x9 in.; pp. 403; halftones and line cuts. Published by The Macmillan Co. $4.

INTERNATIONAL ASSOCIATION FOR BRIDGE AND STRUCTURAL ENGINEERING—Final Report of the Paris Congress. Cloth; 7x10 in.; pp. 715; halftones, line cuts and tables. Published by Leemann & Co., Zurich, Switzerland. Printed in French, English and German. Price 36 Fr. (Swiss).

MANUAL OF FINANCIAL AND ACCOUNTING PROCEDURE FOR PUBLIC BODIES—Federal Emergency Administration of Public Works. Paper; 6x9 in.; pp. 87; tables. Superintendent of Documents, Washington, D. C.

MEHRSTUFIGE RAHMENFORMELN—K. F. Sitte. Paper; 6x8 in.; pp. 238; diagrams and tables. Published by Rudolf M. Rohrer, Brunn, Czechoslovakia.

MODERN HOUSING—Catherine Bauer. Cloth; 6x10 in.; pp. 331; 48 pages of photographic illustrations. Published by Houghton Mifflin Co., Boston. $5.

STÜTZMAUERN GRUNDBAU — Vol. IV, Handbuch für Eisenbetonbau. O. Mund and O. Colberg. Paper; 7x10 in.; pp. 96; diagrams and tables. Published by Wilhelm Ernst & Sohn, Berlin, Germany. 6.60 RM.

PUNJAB ENGINEERING CONGRESS—Proceedings, Vol. XXI (1933) and Vol. XXII (1934). Cloth, 6x9 in.; pp. 332 and 148. Numerous line drawings and halftones. Published by the Punjab Engineering Congress, Lahore, India. . . . *Principal contents, Vol. XXI: Several unusual bridge structures; Pressure-pipe observations under the Panjnad weir; Dissipation of energy below canal falls; Theory of earthquake-resisting design; Silt conduction by irrigation outlets; Silt exclusion from distributaries; Experiments with a short-crested weir model. Vol. XXII: A model study of flow under works on sand foundations; Metallic arc welding as applied to bridges; Design of an adjustable proportional module.*

ROAD MAKING AND ADMINISTRATION—Vol. I, The Roadmakers' Library. By Spielmann and E. J. Elford. Cloth; 6x9 in.; pp. 441; halftones and line cut illustrations. Published by Edward Arnold & Co., London, and Longmans, Green & Co., New York. $9.

THE TESTING OF BITUMINOUS MIXTURES—Vol. II, The Roadmakers' Library, by Donald C. Broome and R. [illegible] Child. Cloth; 6x9 in.; pp. 194; halftones and line cuts. Published by Edward Arnold & Co., London, and Longmans, Green & Co., New York. $5.50.

Sewage-Plant Survey—XI

Data from Rockford, Ill.

THE FOLLOWING ARTICLE is the eleventh of a series presenting in brief form the salient design and performance characteristics of American sewage plants. Articles already published have presented data from the following cities: Decatur, Ill., Cleveland, Ohio, Schenectady, N. Y., Aurora, Ill., Lima, Ohio, Grand Rapids, Mich., Urbana, Ill., Baltimore, Md., Toledo, Ohio, and Akron, Ohio.

PLAIN sedimentation without secondary treatment at the Rockford, Ill., sewage-treatment plant reduced the B.O.D. of the community's sewage from 197 to 111 p.p.m., as an average for the year ending April 30, 1933. Settleable solids were reduced from 5.9 to 0.4 c.c. per liter. Detailed design and performance data of the plant are tabulated below.

Rockford's sewage is collected by a combined sewer system, and after treatment is discharged into the Rock River. The river at the point of discharge has a minimum flow of 500 m.g.d. The treatment plant was designed in 1930 by Pearse, Greeley and Hansen, to care for a population of 120,000, contributing a sewage flow of 17.3 m.g.d. Operation of the plant was begun in February, 1932. Total cost of the plant construction to date has been $452,900.

Sewage flow is measured at the plant by a 54x35-in. venturi meter. Analytical results given in the table are based on samples composited over 24 hours.

During 1932 screenings were incinerated; beginning with 1933, they have been ground and returned to the flow.

The digestion tanks are heated by hot-water coils, the circulating water's temperature being maintained by a sludge-gas-fired boiler. Digested sludge is run to the sand drying beds or to sludge-storage tanks. Supernatant liquor is returned to the settling tanks. Dried sludge is removed from the sand beds by hand labor, using industrial railway dump cars.

The data here presented were made available by P. M. Snyder, superintendent.

SEWAGE-PLANT PERFORMANCE DATA, ROCKFORD, ILL.

GENERAL DATA

Population, 1933	100,000
Population served, 1933	75,000
Sewage flow	
Average, m.g.d.	6.6
Maximum day, m.g.d.	15.1

SEWAGE-TREATMENT UNITS

Coarse Screens	
Number of units	1
Width of opening, in.	1
Submerged area of screen, vertical projection, sq.ft.	45
Angle of screen with horizontal, deg.	90
Method of cleaning	mechanical rake
Grit Chambers	
Number of units	2
Plan dimensions, each unit, ft.	15x15
Operating depth, including grit space, ft.	2½
Depth alloted to grit space, ft.	1
Sewage flow, each unit, m.g.d.	3.3
Detention period at actual flow, each unit, min.	1.05
Method of cleaning	revolving scraper
Frequency of cleaning	twice daily
Primary Sedimentation Tanks	
Number of units	2
Plan dimensions, each unit, ft.	48x120
Operating depth	12-13
Provisions for sludge removal	longitudinal scraper
Frequency of sludge removal	12 times daily
Sewage flow each unit, m.g.d.	3.3
Detention period at actual flow, hr.	2

SLUDGE DISPOSAL

Sludge Digestion Tanks	
Number of units	2
Diameter, each unit, ft.	50
Depth, each unit, ft.	41
Sludge capacity, each unit, cu. ft.	52,500
Sludge capacity actually used, cu. ft.	40,000
Temperature maintained, deg. F.	85
Sludge-Drying Beds	
Number of units	7
Length, each unit, ft.	203
Width, each unit, ft.	50
Depth of sand, in.	4

ANALYTICAL RESULTS

	Settleable Solids, (2 hr.) c.c. per liter	Suspended Solids p.p.m.	Total Solids p.p.m.	Five-Day B.O.D. p.p.m.
Raw sewage	5.9	235	835	197
Settling-tank effluent	0.4	90	690	111

SCREENINGS, GRIT AND SLUDGE

	Volume Cu.Ft. Per M.G.	Dry Solids Per Cent	Volatile Solids Per Cent	pH	Disposal
Coarse screenings	1.8	...	....	....	Ground and returned to flow.
Grit	7.9	40	50	....	Used as fill.
Settling-tank sludge	608	5.6	70.1	7.0	To digestion tanks.
Digested sludge	258	5.1	48.0	8.0	To drying beds.
Dried sludge	21.8	50.0	40.0	....	To the public for fertilizer.

Letters to the Editor

New and Old Dover-Portsmouth Bridges

Sir—The article "High-Level Bridge Link in the Dover-Portsmouth Road," (*ENR*, Sept. 27, 1934, p. 387) describes the exceptional design and construction methods employed in building the new bridge across Little Bay from Dover Point to Newington, N. H. This new bridge replaces an old pile combination railroad and toll-highway bridge originally built by the Portsmouth & Dover Railroad and opened to traffic *Feb. 1, 1872. In the spring of 1918* about one-half of the pile bridge was carried away by the ice in the rapid current but was immediately rebuilt by the Boston & Maine Railroad.

For 62 years this old toll bridge, now inadequate for modern travel, had served as a gateway from New Hampshire's short ocean coastline to Dover and the whole of eastern New Hampshire. In 1933 the state purchased it from the Boston & Maine Railroad for $275,000, and it was closed to traffic when the new steel bridge was dedicated.

The first bridge in that locality was a planked pile bridge, 2,362 ft. long and 38 ft. wide, and was opened to traffic Nov. 25, 1794, but gave way in 1830 and again in 1854. That bridge was finally abandoned in 1855 after 600 ft. of it had been carried away by the ice in the spring break-up.

Government records show the mean range of tide at Dover Point to be 6.4 ft. (observed June to August, 1913). At the Newington shipyard in 1917 and 1918 the writer found that the range of tide between extreme high water and extreme low water was 14.1 ft. His mean range of tide, for 125 observations of high water and 63 observations of low water, was 6.5 ft. The Newington shipyard was about 1½ miles down the river from Dover Point.

The main stretch of 20-ft. concrete road, 5½ miles long, from Dover to the Little Bay Bridge at Dover Point, has been completed in connection with the new bridge project. This concrete road connects with the end of the concrete street pavement through Dover.

During the years 1929, 1930 and 1931 the city of Dover constructed 52,972 sq.yd. of modern high-class concrete pavement and 6,986 lin.ft. of new concrete curb along its main thoroughfare, Central Ave. That improvement was about 2 miles long and from 36 to 80 ft. wide between curbs. Existing granite curbing was straightened up, and new concrete curbing was placed where necessary. The new concrete pavement was laid mostly over old grade, but gravel subgrade and tile drains were placed where good engineering practice required them.

The 7-in. slab was reinforced with wire mesh weighing not less than 50 lb. per 100 sq.ft.; the mix was 1:2:3, and ½-in. expansion joints were placed transversely from 30 to 50 ft. apart. Only about $100 has been spent on these 2 miles of concrete pavement since it was constructed, and that was spent for refilling joints. Thousands of dollars were spent annually to make this avenue passable before the pavement was laid. Some motorists seem to think that this wide pavement was built for a speedway, but their line of thought has often been changed by means of fines in Dover's police court.

In 1931 the state of New Hampshire continued the city's concrete pavement on the north, where the Dover pavement ended, to connect with about 5 miles of 18-ft. concrete road built in 1927. This makes some 13.5 miles of almost continuous modern concrete road and city pavement from the new Dover Point Bridge through Dover, and a portion of Somersworth and Rochester on the road to the White Mountains. Those 13.5 miles of modern concrete pavement and road cost the city of Dover and the state of New Hampshire something over $600,000, and they are well worth the price.

Dover, N. H., Oct. 2, 1934. WALTER S. WHEELER, Civil Engineer and Surveyor.

Trends of Building Costs

Sir—In the *Engineering News-Record* of Sept. 6, 1934, there was an article by F. J. Knox entitled "Four Comparable Buildings Reveal Trend of Costs Since 1928." In the main this article presented as a fact that the cubic-foot costs of university classroom buildings today were 40 per cent lower than in 1928 despite more elaborate finishing. This does not appear consistent with the cost index shown in the same issue for September, 1934, of 200.58 and the average index for 1928 of 206.78.

While it is true that building costs today are less, I question whether 40 per cent means anything in the comparison that was made in the article. For instance, the building shown as constructed in 1928 is approximately 2½ times smaller than the one compared as being built in 1934. A rough comparison of building walls and floors reveals a much higher ratio to the cube foot for the building built in 1928 and shows that the cube-foot relation to square foot is much less, all of which tends to make a cube-foot cost higher.

The items of equipment entering into a given building will naturally vary considerably. For illustration, one elevator was installed in each of the two buildings in question in spite of the fact that there is 2½ times difference in the cube volume. This would not reflect lower construction costs.

It would seem to me that the article did not fairly give a comparison when it failed to take into consideration these controlling factors and creates a misunderstanding in the construction industry when similar results cannot be substantiated in actual cases.

Lansdowne, Pa., Oct. 5, 1934. A. G. MIDDLETON.

Sir — Answering Mr. Middleton's comments: The purpose of the article was to draw attention to the wide variations in cubic-foot costs for four buildings, similar as to use but differing considerably as to plans and specifications, location and construction conditions. The 40 per cent variation in *cubic-foot costs does not indicate* a similar decline in construction costs over the seven-year period of 1928-1934. Specific mention of a 14 per cent decline is made in the third paragraph of the article. The schedule of finishes proposes to show what could be included in a building for the cubic-foot cost under the varying conditions encountered in the seven-year period. The cubic-foot costs used in the analysis are actual, except in the case of the building under construction, where contract award figures are the basis. In the comparison there was no attempt to go into the vagaries that attend the use of cubic-foot costs, that subject being treated by the author in the 1934 edition of *Construction Costs*.

New York, N. Y., Oct. 9, 1934. F. J. KNOX.

Railway Sea Embankment

A railway embankment 7 miles long, across an arm of the North Sea, connects the railway system of Germany with its lines on the island of Sylt, thus eliminating a former indirect steamer service. The water is mainly shallow, and the fill averages 25 ft. in height, or 5 ft. above the maximum water level in rough storms. The hydraulic-fill core is covered with a layer of clay 33 in. thick on the slopes and 19 in. on the top. From the single-track subgrade, 37 ft. 9 in. wide, the side slopes are 1 on 3 for a width of 24 ft. 6 in. and then 1 on 8 for 20 ft., the latter rounded off to a slope of 1 on 1½ extending 20 ft. to the toe, making a total base width of about 166 ft. On the flatter underwater slopes is a revetment of concrete slabs, which is changed to stone blocks 12 in. thick for the steep slopes to the toes, both slabs and blocks being laid on a course of broken stone. The toe on the more exposed side is further protected by three rows of piles in a fill of loose rock. This embankment forms a branch from the sea embankment or levee built along the coast line of the mainland to protect the low-lying shore lands from high water and storms.

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EDITOR—F. E. Schmitt. EDITORIAL STAFF—V. T. Boughton, W. G. Bowman, F. W. Herring, C. S. Hill, H. W. Richardson, J. I. Ballard, W. W. De Berard, N. A. Bowers.

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December 27, 1934

Three Educators

THE ENGINEERING PROFESSION has lost three outstanding educators within the past three weeks, Palmer C. Ricketts, William H. Burr and Milo S. Ketchum. It would be difficult to pick three men who have had so wide a contact with engineers in their young and impressionable years and who have thereby left their impress on so large a part of the profession. Each of the three stands out as a distinct personality and educational influence. In this they give evidence that even in the field of education—where we are inclined to look upon all as of one type—there is opportunity for men of widely different characteristics. This is a particularly refreshing thought, especially for the young engineer, in these days when so much question is raised as to why a young man should study engineering. To that question it serves but to add to the force of the answer that if a man's inclinations are toward engineering the mental discipline of that training will better fit him for almost any field of human activity.

State Planning

THE PAST YEAR has been an abnormally active one in the matter of state and national planning. Fostered by the Public Works Administration through the allotment of funds and the assignment of trained consultants, local planning agencies are at work in 40 states. These facts were brought out in the planning section of the recent report of the National Resources Board. Unlike city and metropolitan regional planning, state and national planning is a relatively new art, and as a result there is little definite information as to the lines along which it should proceed. For that reason, the article by V. B. Stanbery in this issue will be of wide interest, especially in those states where state planning has not yet been begun or where it is in the formative stage. Because this article relates primarily to planning for public-improvement work—a major question at the present moment—it should help to crystallize state planning efforts by giving them a defined objective upon which to concentrate in the period when much effort frequently is wasted in aimless dealing with generalities.

Public Works in Canada

CANADA'S PUBLIC-WORKS program is interesting in that it is being launched at a time when business conditions in that country give many indications of definite improvement. As a consequence its effect will be watched with interest by those who have maintained that the purpose of a large public-works program is not to supplant private construction that has fallen off due to the business depression but to give impetus to the normal forces tending toward recovery. The Canadian program differs from ours in this country in that it is much smaller, even proportionately, and in that it is being carried out by existing governmental departments rather than by a special agency such as the PWA. Further, the money all is being spent on normal governmental undertakings, mostly of limited size and widely scattered through the provinces where the need is greatest. In this it conforms closely to the ideal that was set up by those who first proposed the public-works program here. Had the ideal been adhered to more closely here it is of interest to speculate how much more effective our program might have been.

Transportation Builders

THE ACKNOWLEDGED PLACE of the highways of North Carolina among great state public-road systems is due in large measure to the work of Frank Page, who died last week. The state's roads are his memorial, just as the statewide electric power service enjoyed by the same state is the memorial of James B. Duke. Page's contribution is a timely reminder of the powerful influence of personality and individual strength of conviction in the development of our present-day network of efficient roads. Each of the states that stands out among its fellows by reason of its highway excellence owes the creation of that asset mainly to a single man's vision and strength—Illinois to Clifford Older, Iowa to Anson Marston, Michigan to Frank Rogers. And in quite the same sense the system of the United States as a whole is the reflection of Thomas H. MacDonald. These men, modern counterparts of the railroad giants of earlier days, are the transportation builders of the present age. They have set their successors a lofty example.

Enforcement Fails

THE SENSATIONAL ACTION of the National Industrial Recovery Board in suspending the provisions of the lumber code under which minimum prices were set as a means of industrial and natural-resource conservation appears to forecast the general termination of price-fixing. Its justification in fields other than natural-resource products has long been under challenge, and now it is recording a failure in this field, too. The failure was in enforcement. While in coal production the control of prices has been made a working success, to the point where not only the industry but also labor defends it as essential, in the lumber field the fatal obstacle was extensive violation of the price regulations. The failure of enforcement here is a notable revelation of the weakness of the NRA organization as it exists today. But the fact is that enforcement is most difficult in respect to prices, and this is one of many reasons that call for complete abolition of price fixing through codes. If the code plan of industrial stabilization is to survive for another year it will evidently have to rest on labor clauses and fair-trade-practice provisions alone. Price control has in many cases unbalanced the relations existing between producer and consumer, and therefore the restraints which it imposed could not be maintained. If it is proved a failure in the basic instance of lumber, fairness and consistency require that it be eliminated in all other fields as well. Protection to labor, to resource conservation and to trade integrity can be assured through rules governing working conditions and trade practices, if adequately enforced. Quite

like contracting, manufacturing industry should require no safeguards beyond these.

Business Finds No Cure

TO ENGINEERS the most significant feature of the compromise conclusions on recovery procedure that emerged from the clash of business opinion at the White Sulphur Springs conference last week is the negative conclusion on unemployment. Despite the importance of the subject the conference made no constructive finding concerning it, but rested its case in the fine generality that "the most effective solution of the problem of unemployment and relief is the creation of such confidence between industry and the government that business can proceed with plans to develop new industries, to enlarge existing enterprises and freely to place private capital in the investment field" —a statement that, however excellent in the abstract, contains no present cure for unemployment. Thus, the circles of business, industry and finance that during five years failed to provide the normal wage-earning opportunities for millions of workers, and that in this time devised nothing better than a code system designed to prevent the very enlarging of existing enterprises that they now urge, confessed themselves unable to produce a directly useful recovery plan. Under these circumstances they might have been expected to support a vigorous campaign for initial reemployment in public-works construction. Far from doing so, however, they avoided all mention of the recovery value of public construction. Can it be that intelligent men of industry have not yet learned that the wage-earning worker supports industry quite as much as industry supports the worker, and that if industry fails to start the working process the wage-earning worker must start up industry's processes?

Destructive Counsel

EVEN STRANGER than the absence of definite recovery recommendations is the proposal of the White Sulphur Springs conference that normal public-works construction be used for relief purposes, a sort of CWA device for dispensing dole payments to relief workers. The representatives of business and industry overlooked the fact that this plan would effectively destroy the construction industry, essential unit of the industrial fabric. They made no proposal for operating food manufacture, locomotive building or chemical production on a relief-work basis, but chose an industry that was not represented at the conference. These are the astonishing proposals of the conference, after its expression of opposition to an expanded public-works program: first, that where such a program is already under way the wage rate should be substantially less than that paid by private industry; second, that direct relief payments should be materially lower than work-relief payments; and, third, that normal public construction should be used to provide work for the idle, "at wages not in excess of direct relief payments." Such practices not only would make a real reemployment program impossible, even the entire present PWA program, but would take over the small residue of public improvements that still can be built through normal channels and make of it a dole-wage agency. If the destructive counsel were followed, public-works construction would cease being a normal business operation. Since public construction is almost the whole of construction today, the plan would effectively wipe out the construction industry.

Principle Controls Accounting

QUESTIONS of vital bearing on the sound administration of public affairs are raised by the National Resources Board's views on power, expressed in its report made public a week ago. The fundamental issue is whether we are willing to recognize good principle in public undertakings.

The National Resources Board, in speaking of hydroelectric power, said that where the water stored by flood-prevention, irrigation or river-equalization dams can be used for power, "the capital cost properly attributable to the generating unit is not the cost of the whole undertaking but merely the extra cost of installing generators and transmission lines." This statement tacitly places power generation in the position of a by-product. The fact, of course, is that power generation is not at all a by-product that may be sold for whatever it will bring in preference to wasting it in the dump; under all but exceedingly rare conditions power is a major and essential product that ranks with any of its associated products and should bear its proper share of the cost of the entire undertaking.

In other form a like principle enters into public affairs where productive investment is not charged with its actual carrying cost, on the ground that the bonds issued to pay for the works have already been retired in whole or in part. Bond retirement or no bond retirement, the capital cost survives and its carrying charge is inevitably present as part of the cost, and the fact that last year's consumers were overcharged on the score of debt service does not alter the inevitable remaining capital cost. Depreciation and obsolescence are the only capital-charge reductions that may properly be counted.

Appeal to the same background principles of sound method is warranted in connection with a remarkable statement made within the last few days by the mayor of New York City on his revolutionary plan to establish a municipal power plant. Explaining his purpose to supply city lighting and power requirements in view of the claimed excessive rates demanded by the company which now furnishes the supply, Mayor LaGuardia is reported to have said that in these days power is just as essential to community life as water, and "these services should be operated without profit." To contrast with this view of power service we have the much-publicized case of a midwest city which operates municipal power supply at rates righ enough to yield a profit capable of paying the full local government cost without dependence of taxes. Both extremes of practice are equally unsound. To burden one special service with charges so high as to subsidize many other services that should pay their own way is too obvious an inequity to admit of justification. By the same token the conduct of either water or power service on a no-profit basis is a direct invitation to business disaster—aside from being indefensible on the score of unfair competition.

In these times above all, when the nation as a unit is putting forth herculean efforts to organize the country's activities on a basis of fair competition and sound method, all such aberrations of thinking as depart from the fundamentals of good business conduct for the sake of the moment's expediency deserve the careful scrutiny of every citizen, and of the engineer in particular, so that they may be seen for what they are—unsound practices that but forecast a day of heavy reckoning.

CURRENT NEWS

Congress To Study Government Policy On Waterways

(Washington Correspondence)

THE POLICY of the federal government in the programming and constructing of inland waterway facilities and in the operation of federal and private barge lines on the Mississippi River will probably be reviewed by Congress and the I.C.C. during the next few months as the result of a report to be submitted by Transportation Coordinator Eastman covering the question of government subsidizing of various forms of transportation.

Tolls on barge lines using routes maintained in navigable condition by the federal government is expected to be one of Eastman's recommendations. That consideration will be given to the feasibility of charging tolls has been indicated by President Roosevelt. The proposal will arouse bitter controversy involving the Government's whole policy as expressed in Section 500 of the Transportation Act of 1920 "to promote, encourage and develop water transportation" and extended in the Denison Act of 1928.

Railroads forced the issue on the Interstate Commerce Commission several months ago by attacking the joint routes, rates and differentials which they have been required by the ICC to establish in conjunction with barge lines under the Denison law. The investigation subsequently ordered by the commission has been set down for initial hearing in New Orleans March 20.

The fate of the government-owned Inland Waterways Corp. is involved in the commission's investigation and Coordinator Eastman's proposals. The railroads have contended for years that the government should retire from the barge transportation business and leave the inland waterways to private enterprise, including the rail carriers in the event that they might elect to take to water. The government and private barge lines charge, on the other hand, that rail rates have been cut so deep that they can't maintain sufficiently low differential rates to attract an adequate volume of traffic.

Illinois Utilities Exempted from Paying Sales Tax

A state sales tax of 2 per cent levied in Illinois in lieu of a state real estate tax need not be paid by utilities, private or municipal, according to a State Supreme Court decision handed down Dec. 20. The tax would have netted the state $4,800,000 annually. The point made by the court was that utilities are engaged in rendering a service and not in selling a commodity.

Constitutionality of the diversion of gas tax to the schools of Illinois was upheld.

New York Seeks Federal Funds For Municipal Power Plant

Following the rejecting of bids for supplying electrical power for the New York City government in 1935, because the rates were considered too high, Mayor LaGuardia conferred with President Roosevelt and PWA Administrator Ickes and received "reasonable assurance" of federal financing for a municipal power plant. Present tentative plans involve a $15,000,000 power plant supplying current to municipal and federal buildings and other public purposes in New York City. Actual approval of the program now awaits submission to the PWA of definite plans showing that the program will be a self-supporting municipal system. The annual electric light bill of New York City is about $14,000,000, and the federal government pays about $470,000 annually for electric service to its buildings in the city.

New York Chapter of A.A.E. Disbands to Join National Group

The New York Chapter of the American Association of Engineers, at a meeting on Dec. 17 voted unanimously to disband in favor of the National Society of Professional Engineers. The chapter voted to make a contribution of $1,300 to the national body, and the balance of $400 in the chapter's funds was voted to be turned back to the national headquarters of the A.A.E. This division of the funds of the New York Chapter was based on the ratio of licensed to unlicensed engineers having membership in the chapter. It is the general understanding that the licensed engineers who are not already members of the national society will join that organization.

Additional RFC Loan Will Finish Twin Lakes Diversion Project

An additional loan of $875,000 to the Twin Lakes Reservoir & Canal Co., an irrigation district of Ordway, Colo., has been announced by the RFC for the completion of the company's trans-mountain diversion project at Independence Pass. An RFC loan of $1,125,000 in 1933 enabled the start of the diversion project, which in full consists of a tunnel under the Continental Divide, another tunnel tapping Roaring Fork River and a series of collection canals. The main tunnel, a diversion dam on Lincoln Creek and one of the collection canals are now under construction, contract being held by Platt Rogers, Inc., Pueblo. Under the project 50,000 acre-ft. annually will be diverted from West Slope streams, carried through the Divide to Twin Lakes, present storage facilities of the company, and then released into the Arkansas River for distribution to an irrigation district 250 miles downstream. The general project and tunnel driving operations were described in *ENR* Dec. 13, 1934, p. 752.

NRA Makes Rules for Construction Code Hours and Wages

IN ADMINISTRATIVE Order X-124 issued December 17, the National Industrial Recovery Board has ruled that time out during the course of a work day due to breakdowns, delays and time spent waiting for materials, or waiting for loading or unloading of railroad cars or other vehicles of transportation or interruptions due to other causes may not be construed as time not worked and not computed in determining maximum hours of labor and wages of such employees.

Complaints have been received that certain employers subject to various codes required employees to take time out without pay for such periods of inactivity. The board has ruled that interruptions in work beyond the control of the employee may not be deducted from the computation of hours whenever the imminence of resumption of work requires the employee's presence at the place of work. Such requirement is to be presumed in the absence of adequate prior notice from the employer that the employee is free to leave the place of employment if he desires. The employer may not, however, by notifying the employee that he is free to leave for an interval too brief reasonably to be considered a temporary lay-off.

The NRA has approved Interpretation No. 3 of Chapter I of the Construction Code with reference to specification of "prevailing wage" as the wage to be paid on a construction project. The application for this interpretation was made by the State NRA Compliance Director for Alabama, and approval was recommended by the Construction Code Authority.

The facts in the case are that a state government agency prescribed that members of the construction industry doing certain work for the state should pay the "prevailing wage" in the "locality" in which the particular project is being performed. The question was asked whether this exempted the contractor obtaining such work from the wage and hour provisions of the Construction Code. It is stated that Section 3 of Article III of Chapter I exempts from the provisions concerning hours of labor or rates of pay any employer required to comply and complying with the hours of labor or rates of pay which have been established for specific projects by competent governmental authority or agency (whether Federal, State or political subdivisions thereof) acting in accordance with the law.

The interpretation states that the action of a state agency in prescribing that a contractor pay the "prevailing wage" fails to meet the requirements of the code, because "prevailing wages" are not susceptible of specific and definite determination, but also because of the requirement that prevailing wages be those in the "locality" in which the particular project is being performed.

San Francisco Bay Bridge Gets $10,000,000 RFC Loan for Tracks

An additional loan of $10,000,000 to the California Toll Bridge Authority has been authorized by the Reconstruction Finance Corporation to complete the San Francisco-Oakland Bay Bridge project now under construction, by adding traction lines, approaches and terminals. Further, the RFC granted the authority the right to use the $5,000,000 which has been saved as the result of lower construction costs out of the original loan of $61,400,000 for the bridge. The agreement under which the interurban traction lines will be granted a franchise to use the bridge, according to reports, provides for elimination of several passenger ferry lines now in operation between the eastern bay communities and San Francisco. This new agreement contemplates collecting from the traction companies at least 2½ cents per passenger carried, for the privilege of using the bridge and equipment until it is paid for. This figure is considered sufficient to provide revenue necessary for amortizing the new loan.

J. H. Shea Co. Holes Through First Major Aqueduct Tunnel

Construction crews of the J. H. Shea Company, on Dec. 14, holed through the Cottonwood tunnel of the Colorado River Aqueduct, the first major bore on the aqueduct system to be completely excavated, according to reports to Metropolitan Water District offices in Los Angeles. Excavation of the tunnel, which is about 150 miles east of Los Angeles and northeast of Mecca, was completed seventeen months after the beginning of work. The tunnel is 3.8 miles long. Driving operations were carried forward from two portals, east and west. A total of 610 ft. of excavation per month was averaged on a six-day week basis.

Northwest Regional Conference Meeting Discusses Development of Columbia River

DEVELOPMENT of the Columbia River as the outstanding natural resource of the region featured discussion at the meeting of the Northwest Regional Planning Conference held in Seattle, Wash., Dec. 12-14. The proposal for the creation of the Columbia Valley Authority, offered by Marshall Dana, chairman of the conference and regional PWA official, was not adopted by the conference. An important resolution passed at the meeting recommended the expansion of the Grand Coulee project to include the ultimate high dam, without immediate power or irrigation development.

Much of the discussion of Columbia River development centered on a plan for navigation development. An inland waterway system reaching into every one of the four Northwest states by means of the Columbia, Snake, Willamette and Missouri Rivers was advocated, as part of the development of power resulting from the present work at Grand Coulee and Bonneville. The flood control benefit resulting from this river development work was an added point.

Coordinated power

On the subject of coordinated power development in the Pacific Northwest, J. D. Ross, head of the Seattle municipal power system, proposed the interconnection of the Grand Coulee and Bonneville systems with the Skagit development of Seattle. This combined system, he explained, would form "an industrial backbone to extend through Washington and Oregon into California." Mr. Ross was opposed to the establishing of a Columbia Valley Authority.

The Grand Coulee project received special consideration and a particularly significant recommendation was made by the irrigation subcommittee of the power division. The recommendation stated:

"The Columbia Basin development needs a high dam (at Grand Coulee) and depends for success on repayment of a large part of the investment from power revenues. This cannot be done under the present and reasonably prospective conditions of the power market.

"The low dam is not useful for irrigation, and power from it cannot be marketed in a reasonable period of time. The justification for the construction work now going on lies only in relief of unemployment and long range anticipation of future needs.

"Public interest would be better served by undertaking at this time the construction of a high dam with the power installation to be added later as warranted by the growth of the market, rather than by building the low dam now primarily for power production."

A feature of the meeting was the address by E. S. Draper, land planning and housing director of the Tennessee Valley Authority, who described the present work and plans now being carried forward by the TVA.

At the conclusion of the three-day session, resolutions were adopted advocating: Immediate development of the Columbia River for navigation up to Walla Walla; surveys for flood control, stream pollution and fisheries with state and federal funds; preparation of an inventory of federal resources with relation to future industrial and power development; state and local classification of land; continuation of the CCC; sustaining of timber development by balanced cutting and reforesting.

The meeting was attended by about 600, and was followed by a meeting of the Washington State Planning Council.

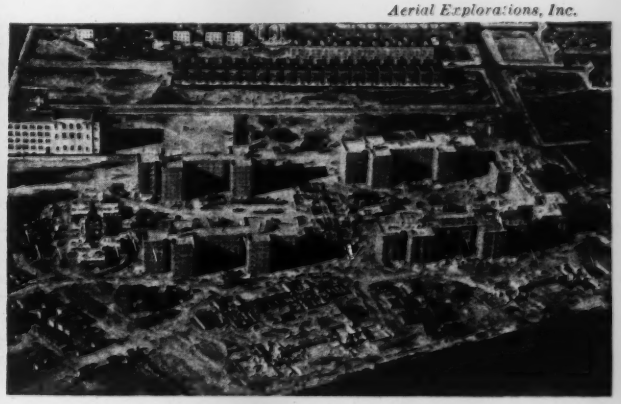
TWO IMPORTANT LARGE-SCALE LOW-COST HOUSING DEVELOPMENTS WELL ADVANCED IN NEW YORK CITY

Progress on the two PWA-financed limited-dividend housing projects in New York City has been rapid in recent weeks. The Boulevard Gardens development in the Woodside, Queens section (right), was held up for nearly two months because of a jurisdictional labor strike, but is now actively under way. The Hillside Housing development in the Bronx (left) has gone ahead rapidly from the beginning, and the first unit is scheduled for an April opening. There are only two other PWA limited-dividend housing developments of large size in the country, Juniata Park in Philadelphia and Neighborhood Gardens in St. Louis.

The Boulevard Gardens housing, to cost about $4,000,000, consists of ten 6-story semi-fireproof elevator-equipped buildings providing 957 living units; six of these buildings are above ground. The land covered by buildings constitutes 27 per cent of the site. The owner is the Dick-Theyer Corp., a well known building development company in Queens.

The Hillside Housing project, to cost about $5,700,000, will provide 1,435 living units in a large group of buildings, mainly of four-story walk-up type although the central unit is a 6-story elevator-equipped structure. Buildings cover 34 per cent of the 14½-acre plot. Clarence Stein, designer of the well-known town-planning town of Radburn, N. J., is the architect. Starrett Brothers & Eken is the builder and one of the principal financial backers of the Hillside Housing enterprise.

Aerial Explorations, Inc.



Chemical Method Adopted for Twin Cities Sewage

Sanitary District votes for engineering board's plan after consultants approve — Townsend supports preference for activated sludge

BY A VOTE of 5 to 1 the trustees of the Sanitary District of Minneapolis-St. Paul Dec. 18 adopted the chemical precipitation method of sewage disposal as outlined in *ENR* Nov. 8, p. 601. Before adoption there was a further review by three firms of consultants, Greeley and Hansen, Fuller and McClintock and Consoer, Older, Quinlan and Townsend. The chemical precipitation recommendation had been made in a report by the PWA Board of Review, Col. C. W. Kutz, Prof. Frederic Bass and W. H. Carey, PWA state engineer. Messrs. Greeley and Emerson for the first two named firms concurred in the recommendation of the PWA board but Darwin W. Townsend for his firm called attention to a combination of screening plant and activated sludge units which would be $58,000 to $90,000 cheaper in annual operating cost than the plan adopted.

In his report, Mr. Townsend states further that the Board's proposal to digest acid sludge (resulting from the use of ferric chloride as a coagulant) has hitherto been unused. Mr. Townsend agrees, however, that 33⅓ per cent reduction of the B.O.D. for 10 months and 70 per cent reduction for 2 months of the year may be considered adequate to maintain a dissolved oxygen residual of 2 p.p.m. in the receiving waters.

Concerning sludge disposal he concurs that burial is the best procedure. Further Mr. Townsend states:

"I am unable to and do not concur in the views expressed by the Board of Engineers in the report, that the type of plant which they recommend is the only one deserving of a major portion of consideration. The activated sludge process supplemented by various appropriate and necessary adjuncts has, in my judgment, been considered by the Board of Engineers in part only.

"Through the continuous, or rather full time use, of coarse screens, grit chambers and drum screens with 1/16-in. slot openings, it is estimated that from 12 to 15 per cent of the suspended solid and from 8 to 10 per cent of the B.O.D. will be removed daily from the entire average dry weather sewage flow of 134 m.g.d.

"During 9 to 10 months of the year from 30 to 35 m.g.d. of the above described preliminarily treated sewage would be given activated sludge treatment, through which from 93 to 95 per cent of both suspended solids and B.O.D. would be removed. The highly purified activated sludge plant effluent when combined and mixed with the screen and grit chamber effluent, free from all unsightly floating matters before its discharge into the Mississippi River water, would result in a composite plant effluent having a 33 to 35 per cent B.O.D. purification.

"During two or three of the critical summer months of the year during which time reduced river water flows might be anticipated, the activated sludge plant would be called upon to treat probably from 80 to 85 m.g.d. to the degree previously noted, the composite effluent at such times showing an estimated B.O.D. reduction, or degree of purification, of from 70 to 75 per cent.

With electrically driven blowers Mr. Townsend estimates the total cost at $3,421,250 and with diesel engine blowers at $3,496,000 with the respective annual costs at $455,275 and $422,760.

C. C. Wilbur is chief engineer of the Minneapolis-St. Paul Sanitary District and J. A. Childs is sanitary engineer.

State Water Authority for New Jersey Recommended by Water Policy Commission

CENTRALIZATION of responsibility for the water supplies of New Jersey through the creation of the "New Jersey Water Authority" has been recommended by the State Water Policy Commission of that state in a report to Governor Moore. The report further recommends that coincident with the creation of the Authority the State Water Policy be discontinued; the North Jersey District Water Supply Commission remain only as an agent of the municipalities interested in the Wanaque, to complete and operate that system; and that the construction powers of the Passaic Valley Water Commission, as applied to new sources, be transferred to the Authority.

The purpose of these recommendations is to center responsibility for the planning, development and operation of an adequate water supply for all parts of the state. The Authority would furnish water at wholesale rates to municipalities served. Municipalities would then sell and distribute to local consumers.

To the new Authority would be allocated the following powers:

(a) Those now exercised by the State Water Policy Commission.

(b) Those pertaining to new projects and control over allocation of waters, as now vested in district commissions and actually exercised by the North Jersey District Water Supply Commission.

(c) Power to acquire public water supply systems and private water companies necessary to a unification of systems that now, or should, furnish water to groups of municipalities.

(d) Authority for new construction of major water supplies, including planning, financing and construction, and their subsequent maintenance and operation.

(e) Control over sanitary conditions in developed watersheds, in so far as this right does not infringe upon existing powers of the state department of health.

The report discusses at some length the water supply problem now facing the numerous communities in the northeastern part of the state. It asserts that early simplification of the means of water supply is imperative to the future of this district. "There is a substantial job ahead for the next five years to bring about necessary interconnections, readjustments of administration of the 32 separate water systems, and the choice and execution of a plan for an additional reservoir with transmission pipe lines," the report states.

"Interconnection of local and group-owned systems should be undertaken as promptly as possible. Present sources of supply are capable of considerable further development. How much cannot be said with certainty in light of present unknown factors. Engineers differ as to the extent it is feasible, but agree that it would take years to negotiate and effect interconnections between enough municipal and private delivery systems to meet probable exigencies.

"Water is interchanged considerably now, but chiefly between adjacent systems. There is no general intersectional pooling. In a measure, pooling has been retarded by the knowledge that some developed sources are undesirable and, with increased pollution, must sooner or later be abandoned. Efforts to interchange these with uncontaminated sources have rightfully met with resistance. Many public and private interests must be harmonized and progress with interconnections and enlargements is sure to be delayed even under the most effective direction of water control. Many municipalities in the district will be hard pressed for enough water to supply their inhabitants after 1945. Some will suffer before 1940 if there is a marked upturn in business. Others should have more and better water at once."

In view of the capacity of present supplies in this district and the magnitude and trend of present consumption, the report states that a new project should be begun as early as 1936.

Financing by the Authority would be patterned after the Pennsylvania act creating the "Allegheny County Authority" and the Port of New York Authority act. The Authority would have the power to construct, maintain and operate water supplies, including improvements and additions, and to charge and collect fees or rentals in connection with the use of water supplied by those projects.

The Water Policy Commission recommends that the control of sewerage not be consolidated with the control of potable water systems. In support of its position, the commission cites the following reasons:

Sewerage problems fall naturally into drainage areas involving municipalities situated along one stream, while a water supply may be brought from a distance to supply several municipalities lying in different drainage basins.

About two-thirds of the water supplies of the state draw upon underground sources, which are mainly unaffected by stream pollution.

Consolidation of water and sewerage control boards would effect no real economies or increase in efficiency because different technical staffs would be required for the two subjects, the development of the two problems has been different, and because sewerage facilities are financed through taxation rather than from direct income. Further, the report states, some of the most pressing sewerage problems in the state involve the Hudson and Delaware rivers, whose solution can be accomplished only through interstate cooperation.

Federal-State Cooperation Urged To End Pollution of Streams

TWO alternate programs for federal control of the elimination of stream pollution have been drafted by the legislative sub-committee of the committee recently appointed by Secretary of War Dern. One of the two plans will be adopted in January at a meeting of the full committee for submission to Congress.

A federal-state cooperative plan is proposed by a majority of the subcommittee. A minority proposal for compulsory control is favored by representatives of sportsmen's organizations on the committee.

R. E. Tarbett, of the U. S. Public Health Service, Thorndike Saville, of the National Resources Board, and Elmer Higgins of the Bureau of Fisheries presented the state cooperation plan at a meeting of the subcommittee on Dec. 17 in Washington. Dr. D'Arcy Magee, of the Izaak Walton League of America and Grover Ladner, president of the National Sportmen's Club, presented the minority report.

Under the majority plan, Congress would be called upon for an enabling act setting up a central federal agency with power to negotiate agreements with State governments to adopt uniform laws or take similar legislative or regulatory steps to end stream pollution.

Predicated on the theory that the Federal Government has Constitutional authority in its maritime, navigation and sanitation powers, the minority plan calls for direct enforcement of a Federal law to restrict and prohibit industrial waste and sewage disposals in streams and other bodies of water. It proposes that a central agency of the Government operating through local planning boards of the National Resources Board develop plans with municipalities and corporations to end stream pollution and then have the authority to require that such work be undertaken.

Both plans are expected to provide for PWA or other Federal loans for construction of necessary facilities.

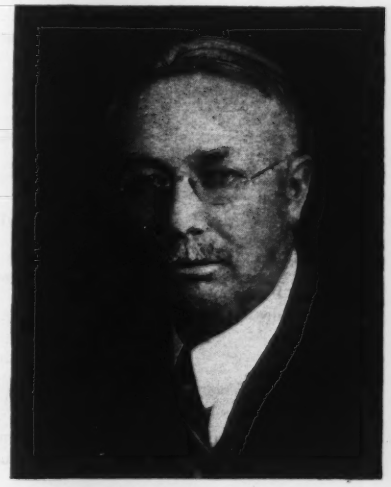
Los Angeles Flood District to Select New Chief Engineer

Qualifications of candidates for the post of chief engineer of the Los Angeles County Flood Control District to succeed Samuel M. Fisher, who has submitted his resignation, are expected to be presented to the county board of supervisors this week. This was indicated Dec. 20 following a conference of the board with a committee of engineers, members of the Los Angeles Section of the American Society of Civil Engineers, selected to serve as advisers to the board in the choice of a successor to Mr. Fisher, who has served since the resignation of E. C. Eaton in September. The committee is composed of H. A. Van Norman, chief engineer of the bureau of water works and supply, Los Angeles; Franklin Thomas, vice-chairman of the board of directors of the Metropolitan Water District and head of the civil engineering department at California Institute of Technology, and Harold L. Doolittle, chief designing engineer, Southern California Edison Company.

Milo S. Ketchum Dies; Dean Emeritus at Illinois

Milo S. Ketchum, dean emeritus of engineering of the College of Engineering, University of Illinois, and outstanding engineering educator, died in Urbana Dec. 19, at the age of 63. Following extensive professional and teaching experience, he became engineering dean at Illinois and director of the Engineering Experiment Station in 1922 and served in this capacity until a year ago, when he retired from active duty.

Dean Ketchum was born in Burns, Ill. in 1872. He received his bachelor's degree from the University of Illinois in 1895 and the degree of civil engineer five year later. He was an instructor in civil engineering in the university of Illinois from 1895 to 1907, followed by two years experience as bridge and structural engineer with



Milo Smith Ketchum

the Gillette-Herzog Mfg. Co. In 1899 he returned to Urbana as assistant professor of civil engineering, remaining four years. There followed a one-year period in which he was the contracting manager for the American Bridge Co., at Kansas City.

In 1904 he accepted the position of professor of civil engineering at the University of Colorado and the following year was made dean of the department. He remained in this position until 1919 and during this period was particularly active in writing many of his textbooks in the structural field.

Dean Ketchum next became professor of civil engineering at the University of Pennsylvania, remaining from 1919 to 1922. In the latter year he accepted the position of dean of the College of Engineering and director of the Engineering Experiment Station at the University of Illinois and continued with this institution up to the time of his death.

While in Colorado he was associated for a time with the engineering firm of Crocker & Ketchum in Denver. During the war period he was on leave of absence from the University of Colorado and served as assistant director on the construction of the government explosives plant at Nitro, W. Va.

The numerous technical volumes which Dean Ketchum wrote during his long career are all well known, and began with the long-standard "Surveying Manual" which he wrote with Prof. W. D. Pence in 1900, and continued to the "Structural Engineers' Handbook" in 1914, with several new editions of the older book published subsequently.

Dean Ketchum was a director of the American Society of Civil Engineers from 1918 to 1921, and a vice-president from 1925 to 1927. He served as president of the Society for the Promotion of Engineering Education for two years.

Bond Required of Milwaukee to Appeal Sludge Suit

If the Milwaukee Sewerage Commission goes through with its appeal from the decision of Judge F. A. Geiger to impound the funds received from the sale of milorganite, which Activated Sludge, Inc. has been able to tie up, it must furnish a bond of $750,000 (*ENR*, p. 710, Nov. 29). The company requested a bond of $1,250,000. The judge indicated the bond should be commensurate with the assurance of recovery. From 1927 to 1933 total sales of milorganite were held by the plaintiff to be nearly $3,000,000. The city's attorney stated that the patentee would be able to collect the amount agreed upon but that it would take 11 years unless a settlement were to be made. A motion to hold up an accounting of the commission's books to determine the amount of damage was denied by Judge Geiger.

Personals

GEORGE E. ATKINSON, formerly designing engineer in the waterworks division of the Department of Public Works, Chicago, is now city engineer of Havre, Montana.

JOSEPH E. SPINK, engineer of Sacramento, Calif., has been named secretary of Sacramento Municipal Utility District.

CARL WAHL has been named assistant director of highways by the state of Ohio. He will be the assistant to John Jasper, who was recently named highway director. He has been county surveyor of Defiance County for six years and served as county resident engineer for the state highway work in that area.

ALEXANDER C. MURRAY, city manager of Fall River, Mass., for the last two years and formerly city engineer, was elected mayor of that city Dec. 18. He is a native of that city and after following engineering work with several railroads, engaged in engineering and architectural practice in Fall River.

Obituary

ARTHUR UNDERHILL, civil engineer and landscape architect, died in a sanitarium at Montclair, N. J., Dec. 11.

JOHN HOSLER, for many years a well known contractor at Canton, Ohio, died in that city at the age of 88 on Dec. 18.

WILLARD BOWEN, for many years active in building contracting in Attleboro, Mass., died in that city Dec. 13 at the age of 72.

STEWART M. NEFF, industrial engineer, who is credited with installing the first high-pressure water system in New York

City, died in Rochester Dec. 23 at the age of 68.

ARTHUR J. MCQUATTERS, construction engineer, died at Albuquerque, N. M., Dec. 8 at the age of 61. During his career in the construction field he had been with the American Light & Water Co., the American Engineering Co., and the Foundation Co.

DANA PIERCE, president of the Underwriters Laboratories, Inc., Chicago, died Dec. 18 in Atlantic City at the age of 63. He has been with the organization since 1906, and has been president since 1923.

OLIVER WESTON CONNET, retired valuation engineer for the Western Maryland Railway, died at his home in Baltimore, Dec. 18. A graduate of the University of Illinois, he had served as assistant city engineer for Baltimore and was in charge of construction of the city's outfall sewer. He joined the engineering organization of the railroad in 1916 and served until his retirement two years ago.

FRANK PAGE, widely known in engineering circles as the chairman of the North Carolina state highway commission during the period when the present system of state highways was instituted and built, died at Raleigh, N. C., Dec. 20, at the age of 59. In 1924 he was chairman of President Hoover's railway safety committee and in 1925 President Coolidge named him on the Pan-American Road Congress. He also served as president of the American Road Builders Association and the American Association of State Highway Officials.

GEORGE A. ELLIOTT, for many years chief engineer of the Spring Valley Water Co., San Francisco, and for the last three years consulting engineer of that city died Dec. 23 at the age of 54. Born in New Zealand, he graduated from the University of Colorado in 1904. He spent a year with the General Electric Co. before going to California where he spent four years in power transmission line engineering. In 1909 he became superintendent for the Spring Valley Water Co., the private utility which served San Francisco, and in 1914 was made chief engineer, a position he held until 1931, when the private company's properties were purchased by the city. During that period he had charge of all design and construction work in water supply development and distribution, including dams, conduits, pumping plants and the city mains. When the company was purchased by the city he established a consulting office in San Francisco and served on several important engineering boards for the state and municipalities on problems of dam construction and water supply development.

CONSTRUCTION STATISTICS OF THE WEEK

ENGINEERING awards at $17,143,000 represent only a 4-day week, due to early closing on account of the Christmas holiday. Of this amount $2,250,000 is for federal work, $12,065,000 for state and municipal, a total public volume of $14,320,000 and private awards of $2,823,000.

Public buildings alone represent a high value for the week, $6,110,000. Highway awards at $3,812,000 are raised substantially by two awards by New Jersey and New York.

The larger awards include: Hudson County tuberculosis hospital, Jersey City, N. J., $2,067,000; completion, Allegheny General Hospital, Pittsburgh, Pa., $2,000,000; demolition, buildings on site of new housing project, Indianapolis, Ind., $1,000,000; highways by New Jersey, $1,210,000 and by New York, $1,264,000; water system, Shawnee, Okla., $500,000; Stevens Creek dam and spillway, Almaden dam and spillway, Almaden-Calero Conduit, Calero dam and auxiliary dam and spillway, Santa Clara Valley Water Conservation District, San Jose, Calif., $547,000; replacing wood piling with steel sheet piling, South Boston, Mass., $896,000; rails for Atchison, Topeka and Santa Fe R.R. Co., Mo., $906,000; and spur track for Los Angeles and Salt Lake R.R. Co., from Desert Mound to Iron Mountain, Utah, estimated at $452,000.

New capital for the week is high. Bond sales total $44,052,000 which includes a $40,000,000 issue sold by New York City for waterworks, rapid transit, bridge, school, dock and "various" improvement purposes. Bond sales also include sale by the RFC of $3,325,000 which transfers that amount from the PWA column to the private capital column. RFC purchase of San Francisco bridge bonds $10,000,000 also swells the total for the week.

CONTRACTS

(Thousands of Dollars)

	Weekly Average Dec. 1933	Prev. 4 Weeks	Week Dec. 27 1934
Federal Government	$5,132	$4,029	$2,255
State and municipal	12,241	14,923	12,065
Total public	$17,349	$18,952	$14,320
Total private	8,267	6,173	2,823
Week's total	$25,641	$25,125	$17,143

Cumulative to date:
1933....$1,068,369 1934....$1,278,863†

†Subject to increase due to adding day labor on Federal TVA and Fort Peck projects. See monthly summary in next issue for amount.

NEW PRODUCTIVE CAPITAL

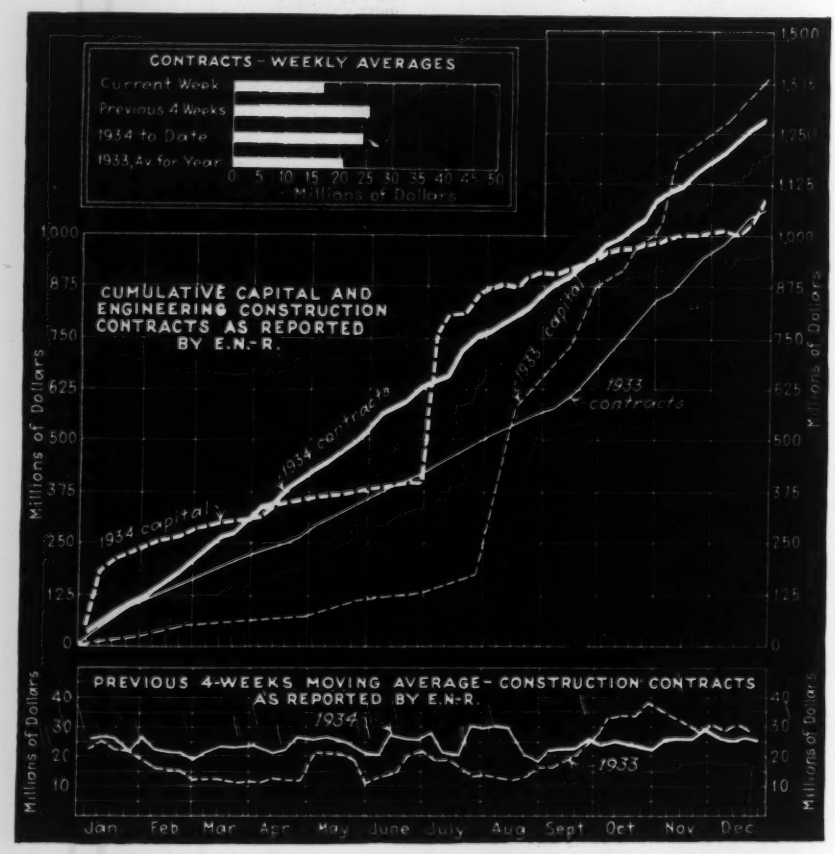
(Thousands of Dollars)

1934	Week Dec. 20	Cumulative
State and municipal	$44,052	$385,018*
PWA allotments, S&M	799	580,497*
RFC loans, S&M	10,000	45,236
Corporate issues	....	22,360
PWA allotments, private	—250	54,998
Total, Non-Federal	$54,601	$1,088,009
PWA allotments, Federal Constr.	32	193,991
Total new capital	$54,633	$1,282,000

Cumulative to date:
1933.....$1,382,957 1934.....$1,088,009

*Includes transfer of $3,325,000 from PWA to Private due to sale of bonds by RFC.

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.


CONTRACTS - WEEKLY AVERAGES
Current Week
Previous 4 Weeks
1934 to Date
1933, Av. for Year
0 5 10 15 20 25 30 35 40 45 50
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY E.N.-R.
1934 capital
1934 contracts
1933 capital
1933 contracts
Millions of Dollars
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY E.N.-R.
1934
1933
Millions of Dollars
Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Conn., Mystic—Mystic Valley Water Co., 129 Water St., Stonington, plans filtration plant to be completed not later than June 1, 1935. Engineer not appointed.

Kan., Fort Scott—City bids in January water filtration plant. $150,000. Awaiting approval of P.W.A. Loan and grant approved. Black & Veatch, 700 Mutual Bldg., Kansas City, engrs. Noted July 19.

Kan., Fredonia—City election Dec. 31, to vote bonds, waterworks system. $80,000.

Kan., Onaga — City soon takes bids filter plant for waterworks. $30,000. C. A. Haskins Co., 517 Finance Bldg., Kansas City, Mo., engrs.

Md., Secretary—Town plans completed and takes bids in a few weeks waterworks, incl. well, pumping station, elevated storage tank and distribution system. $21,000. P.W.A. project. J. R. Cronister, Cambridge, engr. Noted Oct. 25.

N. J., Cedar Grove—Municipality bids after Feb. 1 constructing waterworks. $50,000. P.W.A. funds granted. Noted Oct. 12, 1933.

N. J., Irvington—Bd. Town Comrs. soon takes bids waterworks. $16,000. P.W.A. project. Noted Jan. 11.

Mo., Deep Water — City plans waterworks. $45,000. P.W.A. loan and grant approved. E. T. Archer & Co., 609 New England Bldg., Kansas City, engrs. Noted Mar. 8.

Mo., Seneca—City plans waterworks system $40,000. Bonds voted. A. C. Moore, 4th and Duquesne St., Joplin, engrs.

Pa., North East—Village voted $35,000 for improving water supply system, incl. dam, 12 ft. high on Black Brook to flood area, ¼ mi. x 10 ft. deep with 600,000,000 gal. capacity, constructing pipe line to connect with present system. Total cost $125,000. P.W.A. will supply $100,000, and village $35,000. $10,000 extra for safe margin. **Maturity early in 1935.** H. F. Eaton, mayor and engr. Noted Dec. 6.

Tex., Sweetwater—City, H. Bothwell, mgr., bids after Jan. 1, waterworks system improvements, incl. 7 mi. 14 in. c.i. pipe, 2 small pump stations, fire plugs, etc. $160,000. P.W.A. loan and grant approved. Noted Oct. 4.

Utah, Heber City—City plans concrete storage reservoir. $33,000. P.W.A. loan granted. H. Bledsecker, Magna, engr.

Utah, Orem—City plans replacing wood mains with c.i. pipe. $46,000. P.W.A. loan granted. H. Price, Provo, engr.

Utah, Price—City replacing tile and wood supply main with c.i. and constructing concrete reservoir. $156,000. P.W.A. loan granted. W. Wayman, city engr. Noted Jan. 11.

Utah, St. George—City plans new supply line and concrete storage reservoir. $132,000. P.W.A. loan granted. L. Snow, St. George, engr. Noted Sept. 22, 1932.

Wis., Tigerton — Village, F. Karolus, clk., making plans water works system, $50,000. P.W.A. project. Druar & Milinowski, 830 Globe Bldg., St. Paul, Minn., engrs.

BIDS ASKED

Minn., Walnut Grove—Jan. 7, by Village, A. W. Olson, clk., furnishing 1,230 lin.ft. 6 in. and 700 ft. 4 in. c.i. mains, 1 hydrant with 6 in. and one hydrant with 4 in. hubs, two 6 in. and one 4 in. gate valves.

N. Y., Newark—Jan. 16, at office Dpt. Mental Hygiene, State Office Bldg., Albany, water supply (filter) Newark State School.

Tenn., Algood—Jan. 4, by City, complete waterworks, incl. circular reservoir, rein.-con., 100,000 gal. capacity, 12 ft. high by 35 ft. diam., partly in and partly out of ground, duplicate pumping equipment, watermains, meters, chlorinator and fire hydrants, two 50 g.p.m. pumps working under 260 ft. head, 32,800 ft. 1- to 6-in. c.i. and wrought iron pipe, etc. $35,000. Professor J. A. Switzer, c.e., University of Tennessee, Knoxville, engr.

LOW BIDDERS

Calif., Los Angeles—Bd. Directors, Metropolitan Water District, 306 West 3rd St., F. E. Weymouth, engr., Dec. 17, Schedule 1, Monrovia Tunnels 1 and 2 and appurtenant works, length 7,865 ft. and 940 ft. and Schedule 2, Monrovia Tunnel 3, length 32,114 ft., from West Constr. Co., 615 Richfield Bldg., Los Angeles, $528,100 and $1,782,400 respectively; Schedule 3, Pasadena Tunnel, length 12,143 ft., from L. E. Dixon, Bent Bros. & Johnson, Inc., 609 South Grand Ave., $621,180. Noted Nov. 22.

CONTRACTS AWARDED

Calif., San Diego—See "Sewerage and Waste Disposal."

Ill., Deland—Village, waterworks and distribution system, to General Paving Co., Champaign, Ill., $27,998, using hand labor. **P.W.A.** Bids Dec. 11. Noted Dec. 6.

Mich., Detroit—C. J. Playens, secy. Bd. Water Comrs., furnishing, installing special coatings on interior boiler drums, tubes and economizer tubes at Springwells Plant of Detroit Dpt. of Water Supply, to Dampney Co. of America, 2051 West Lafayette Blvd., $3,540. **P.W.A.** Bids Oct. 30. Noted Oct. 25.

Minn., Russell—Village, V. C. Johnson, clk., furnishing, installing c.i. mains, meters and house connections for waterworks, to Starbuck Constr. Co., Starbuck, $15,537***75,000 gal. or 50,000 gal. steel tank on 110 ft. tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, Ill., $7,985 or $6,700 respectively***8 or 10 in. wells, to Keys Well Drilling Co., Lexington Ave. N., St. Paul, $1,440 or $1,750 respectively. **P.W.A.** Bids Dec. 6.

Miss., Clinton—Town, waterworks improvement, concrete found. for elevated water tank, to Scotland Flint, Jackson, $900***laying watermains, to Stubbs & Clements, Jackson, $2,000 ***water pipe, to McWayne Pipe Co., 1201 Vanderbilt Rd. N., Birmingham, Ala.***fire hydrants, to Columbian Iron Wks., 2501 Chestnut St., Chattanooga, Tenn. **P.W.A.** Total est. $24,000. Bids Nov. 12. Noted Nov. 22, under "Contracts Awarded."

Neb., Lincoln—City, furnishing, laying 2,710 lin.ft. 6 and 12 in. watermains in 12th St., incl. twelve 6 in. and two 12 in. double gate valves, seven 5 in. steamer hydrants and miscellaneous fittings, to A. A. Dobson Co., 824 1st Natl. Bank Bldg., $13,275. **P.W.A.** Bids Dec. 5. Noted Nov. 29.

N. J., Chester—Boro, venturi meter for waterworks, to Builders Iron Fdry., 20 Vesey St., New York, $417***copper pipe, curb stops, boxes, etc., to Mueller Co., Inc., 601 West 26th St., New York, $623***wall and pump, to C. W. Lauman & Co., 50 Church St., New York, $4,034***standpipe to Tippett-Wood, Phillipsburg, Pa., $6,868***constructing (labor), to U. S. Pipe & Fdry. Co., 71 Bway., New York, $11,803***hydrants, to R. D. Wood Co., 400 Chestnut St., Phila., Pa., $1,236***valves, to A. P. Smith Mfg. Co., East Orange, $986. Grand total $25,967. **P.W.A.** Bids Oct. 8. Noted Oct. 4.

N. M., Deming—City, replacing present pipe line with c.i. pipe, to Frish & Heflin, Artesia, $11,790; steel tank and tower, to Pittsburgh-Des Moines Steel Co., 100 Tuttle St., Des Moines, Ia., $25,400. Est. $40,000. **P.W.A.** Noted Nov. 15.

N. Y., Watervliet—City Council, City Hall, 9,500 lin.ft. c.i. pipe and specials to U. S. Pipe & Fdry. Co., Koppers Bldg., Pittsburgh, Pa., $37,595***installing pipe, to A. S. Mundy & Co., Woodbridge, N. J., $12,941***7 gate valves, to Ludlow Valve Co., Troy, $916. Grand total $51,452. Bids Dec. 13. Noted Dec. 6.

Okla., Shawnee—City, clearing and grubbing for waterworks, to Kadane Constr. Co., Frederick, $10,400***dam, spillway, intake wells, to F. T. O'Dell, Hannibal, Mo., $166,310***27 in. flow line, to Hill & Evans, Fort Smith, Ark., using rein.-con. pipe, $152,365***20 in. steel welded pipe, to Benson & Montin Constr. Co., Oklahoma City, $65,263***filter plant, pump station and main improvements, to Hill & Evans, Fort Smith, Ark., $105,748. Grand total $500,086. Bids Dec. 10. Noted Nov. 27.

Tex., Morton—City, H. Cox, mayor, waterworks system, incl. well supply, distributing system, electric light plant, (tentative award), to Winslet & Friday, 4902 East Side, Lubbock, $22,601. Est. $30,000. Bids Nov. 28, awarded Dec. 11.

Tex., Fredericksburg—City, c/o E. Krauskopf, mayor, waterworks system, to Merkle Constr. Co., Kansas City, Mo., $122,118. **P.W.A. (Correction**—name of contractor and amount.) Noted Oct. 25.

Tex., Odem—City, E. S. Butler, mayor, general contract waterworks system, to Ulen Contg. Co., Smith-Young Tower Bldg., San Antonio, $19,709; tank and tower, to Chicago Bridge & Iron Wks., 2919 Main St., Houston, $5,490. Bids Dec. 7, awarded Dec. 12. **P.W.A.** Noted Nov. 22.

Vt., Vergennes—W. G. Fritz Co., general contractors, 69 Main St., West Orange, N. J., constructing earthen dams for gravity water supply system, to B. A. Barton Constr. Co., Inc., Ticonderoga; standpipe, to McClintic-Marshall Corp., 25 Bway., New York, for City, G. W. Stone, clk., City Hall. **P.W.A.** Noted Nov. 29, under "Contracts Awarded."

†Wis., Milwaukee—U. S. Forest Service, Milwaukee, furnishing pumping unit, to Aurora Pump Co., Aurora, Ill., $1,924. Bids Dec. 10.

Section Index

Engineering Structures:

Bridges and Grade Crossings 254
Earthwork, Irrigation, Drainage and Waterways 256
Foreign 258
Materials and Equipment 257
Streets and Roads 254
Sewerage and Waste Disposal 253
Unclassified 257
Waterworks 253

Buildings:

Public 258
Commercial 260
Industrial 260

Federal Government projects are classified under heading denoting type of work and designated by symbol of †

◆

Ont., Kitchener—Council, drilling well at Strange St. for additional water supply, to International Water Supply Ltd., 25 King St. W., Toronto, $16,000. Noted Oct. 4.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Calif., Petaluma — City defeated $195,000 bonds for chemical treatment plans for sewage disposal plant. J. B. Platt, Rosenberg Bldg., Santa Rosa, engr. Noted Oct. 4.

Ind., Gary — City, L. B. Clayton, mayor, making plans sewage disposal plant, $1,400,000. P.W.A. loan and grant approved by U. S. Govt. J. Hayes, city engr.

Kan., Topeka — City bids about February, sewage disposal plant. $275,000. C. A. Haskins & Co., 517 Finance Bldg., Kansas City, Mo., engrs. Noted Sept. 27.

Md., Chestertown—City making plans and takes bids early in 1935, sewage disposal plant and various sewers. P.W.A. project. Whitman, Requardt & Smith, Charles and Biddle Sts., Baltimore, engrs. Noted Oct. 25.

Md., Federalsburg — City, bids in March, sewers and sewage treatment plant. F. Dryden, Salisbury, engr. Noted Nov. 15.

N. J., Ridgewood—Boro, constructing sewers, Projects P.W.A. 7484 and 7486, $70,000 and $38,000 respectively. Bids held up because of legal trouble. R. A. Harton, 25 Hudson St., engr. Noted Aug. 23.

N. Y., Riverhead—Village Sewer District, preliminary plans approved by State Dpt. Health, for sanitary sewers and sewage treatment plant. F. J. Biele, 184 Nassau Ave., Huntington, consult. engr. Noted Nov. 22.

O., Cleveland—City, estimates prepared rein.-con. sewer in Burke Brook from East 55th St. to Harvard Grove Cemetery. $23,130. R. Miller, 517 City Hall, engr. Maturity dependent upon obtaining funds.

Pa., Union City—City plans sewerage system and disposal plant. To exceed $25,000. **Maturity soon.** City Engineer in charge.

Tex., Lone Oak—City, c/o S. S. Frazier, mayor, defeated $19,000 bonds sanitary sewerage system. $25,000. P.W.A. project. Montgomery & Ward, Harvey Snider Bldg., Wichita Falls, engrs. Noted Nov. 15.

Wis., Green Bay — See "Public Buildings, under "Contracts Awarded."

Ont., Lambton Mills—Town Engineer preparing plans sewerage system. $370,000 of which 50% will be materials.

BIDS ASKED

Mich., Jackson—Jan. 3 (extended date), at office P. E. Campbell, city mgr., sewage treatment works, Alternates A, B and C as outlined. Fargo Eng. Co., Union & Peoples Bank Bldg., engrs. Noted Dec. 6.

N. J., Asbury Park—Jan. 3, by C. H. Bishop, city mgr., constructing sewage treatment plant consisting of concrete settling tanks, converting existing septic tank into separate sludge digestion tank, new ventilating stack, and necessary appurtenances. Remington, Vosbury & Goff, 509 Cooper St., Camden, engrs.

N. Y., Bedford Hills—Jan. 22, at office Dpt. Correction, State Office Bldg., Albany, sewers and waterlines at Westfield State Farm.

†*Federal Government.*

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Wednesday
Thursday
Friday

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330 West 42nd St., New York

Sewerage (Continued)

N. Y., Woodbourne—Jan. 22, at office Dpt. Correction, State Office Bldg., Albany, constructing sewer lines at new Institution for Male Defective Delinquents.

N. C., Salisbury—Jan. 3, by Mayor and City Council, "A" 28,500 ft. 18- to 24-in. sewer outfall lines, 57 manholes; "B" pumping station complete, incl. pumping and electrical equipment; "C" 16-in. c.i. crossover discharge line from station to outfall line, approximately 10,500 ft. of which 3,000 ft. will be tunnel; "D" sewage treatment and chlorination plant of sufficient capacity to treat entire sewerage flow of city. $360,000. W. C. Olsen, Raleigh, engr. Noted Dec. 28, 1933.

CONTRACTS AWARDED

Calif., Oxnard — City Council, constructing sewage disposal plant, to J. C. Hickey, 320 South Palm St., Alhambra, $60,080. Est. $72,000. **P.W.A.** Bids Dec. 11. Noted Nov. 29.

Calif., San Diego—City, drainage conduit in street from Texas St. to Euclid Ave., removal of watermain now 10 ft. south of Center, and constructing main 10 ft. from each curb, in El Cajon Ave., incl. 8,356 ft. 4 in. tile, 27,961 ft. 6- to 36-in. concrete pipe, 26,150 ft. 6- to 16-in. c.i. w.m., 15 storm drain outlets, 29 curb inlets, 121,872 sq.ft. asphalt pavement covering ditches, 6,055 sq.ft. sidewalks, 596 ft. curb, S.E.R.A. the labor. Est. $242,957. State to furnish material. H. W. Jorgensen, City Hall, engr.

Conn., Danbury—City, T. McNally, P. Wks., bit. joint material for sewage disposal plant, to Pacific Flush Tank Co., 441 Lexington Ave., New York•••gate valves and hose, to Lovell Valve Co., Troy, N. Y.•••jute, oakum and hemp, to H. E. Meeker Co., 90 White St., Danbury•••sewer castings, to Clark Sewer Constr. Co., 631 Lindley St., Bridgeport•••force pump, to Ralph B. Carter & Co., 53 Park Pl., New York•••concrete blocks, to Childs Kropp, Bethel•••structural steel, wrought iron, perforated pipe and trolley hoist, to Porcupine Co., Post Rd., Fairfield. Noted Dec. 6, under "Contracts Awarded."

Mich., Monroe—City, Project 1, South Side Intercepting Sewer on south side of river, to Waterway Constr. Co., Centerline, $118,570••• Sect. 2, Interceptor Sewer, to George Vella Constr. Co., Monroe, $49,792. **P.W.A.** Noted Nov. 26.

Mo., Joplin—City, extending 39,883 ft. 8- to 18-in. concrete sewers, to Tobin-Walsh Constr. Co., 220 West 39th St., Kansas City, $79,518. Est. $95,000. **P.W.A.** Bids Dec. 11. Noted Dec. 5.

N. Y., Ardsley—Bd. Village Trustees, general contract sanitary sewers, to Standard Impvt. Corp. of Westchester Co., Valhalla, $173,414. **P.W.A.** Bids Nov. 9.

N. Y., Pine Aire Station—Dpt. Mental Hygiene, State Office Bldg., Albany, sewers and waterlines at Pilgrim State Hospital, to Kenlow Constr. Co., Inc., 401 West 59th St., New York, $24,173. **P.W.A.**

N. C., Spindale—Town, S. E. Elmore, mayor, sewage treatment plant, to Boyd & Goforth, Inc., Builders Bldg., Charlotte; lines, to Fiske-Carter Constr. Co., Spartanburg, S. C. Est. $62,000. **P.W.A.** Bids Nov. 22. Noted Nov. 15.

O., Columbus—W. J. Lucks, dir. Service, constructing West Side Alum Creek Sewer from Clifton to Ridgeway Aves., Contr. 7, Sect. 3, to A. F. Riley Constr. Co., 408 Thurman Ave., $71,843. **P.W.A.** Bids Dec. 6. Noted Nov. 29.

O., Washington Court House—City, J. Kent Hopkins, serv. dir. Safety, Contr. A, sewers and connections, to Runck & Ruebel, c/o S. A. Ruebel, 4229 Kirby Ave., Cincinnati, $60,886 •••Contr. B, to Ulen & Co., 38 South Dearborn St., Chicago, Ill., $79,252•••Contr. D, to Pacific Flush Tank Co., 421 Ravenswood Ave., Chicago, Ill., $3,745. Grand total $143,883. **P.W.A.** Noted Nov. 22. Contr. C held up.

R. I., Providence—Tucker Constr. Co., Inc., general contractors, 346 Washington St., steel for sewage disposal plant at Field's Point, to Barker Steel Co., Boston, Mass.•••225 tons c.i. pipe, to U. S. Pipe & Fdry. Co., Burlington, N. J.•••750 tons castings, to Foran Fdry. & Mfg. Co., 11 West 42nd St., New York, for City. F. Nolan, City Hall, engr. Noted Nov. 1, under "Contracts Awarded."

Tex., Fredericksburg—City, c/o E. Krauskopf, mayor, constructing sewer collecting system and disposal plant, to Sherman Machine & Iron Wks., 18 East Main St., Oklahoma City, Okla., $66,121. **P.W.A.**

Va., Clarendon—Arlington Co. constructing Sewer Contr. 15 to J. A. Laporte Constr. Co., 11 West 42nd St., New York, N. Y., $112,542. Bids Nov. 13.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Massachusetts — Commonwealth of Massachusetts, Dpt. P. Wks., 100 Nashua St., Boston, making plans 2,700 ft. rein.-con., structural steel bridge over Taunton River, between Fall River and Somerset, $2,500,000. Will seek P.W.A. funds. F. E. Lyman, comr. A. W. Dean, ch. engr.

Mass., Springfield—City, C. W. Phillips, supt. Streets, City Hall, preliminary plans South End Bridge over Connecticut River. To exceed $25,000.

Michigan—Clinton and Ionia Counties, St. Johns, plan 3 span 165 ft. girder type concrete bridge Maple River and County Line, Clinton and Ionia Counties. $40,000. Allan Williams, St. Johns, co. engr.

Mo., St. Charles—Wabash R.R. Co., E. L. Crugar, ch. engr., Ry. Exch. Bldg., St. Louis, applied to Interstate Commerce Comn. for permission to obtain a $2,350,000 loan for completing double track rein.-con. steel bridge across Missouri River. P.W.A. project.

New Jersey—State Hy. Comn., Trenton, plans expending $735,000 eliminating grade crossings and constructing railroad bridges.

N. Y., Buffalo—Bd. Supervs. Erie Co., plans steel deck bridge across Cazenovia Creek, West Seneca Twp. **Maturity spring 1935.** $56,590. C. H. Fosdick, co. supt. hys.

N. Y., Pavilion—Delaware, Lackawanna & Western R.R. Co., M. H. Doughtery, engr. M. & W., Hoboken, N. J., plans eliminating grade crossing on Pavilion-Canawaugus Hy., about 1½ mi. northwest of Linwood Station. $151,100.

N. Y., Wallkill—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., plans eliminating Howells, Howells Center and Howells Lower Crossings. $83,000.

O., Columbus—City Council plans Main Street Bridge. $400,000. P.W.A. project. Soon takes bids soil testing. W. J. Luck, dir. Service.

BIDS ASKED

Illinois—Jan. 4, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, constructing rein.-con. girder bridge on F.A. Project NRS 417A, Route 48, Sect. 182B-NRS, Macon Co.; steel truss bridge, Project NRS 438A, Route 75, Winnebago Co.; I-beam bridge on creosoted piles, between Dahinda and Route 91, Sect. NRS 437A, Route SA15, Knox Co.; rein.-con. substructure and three I-beam spans for C.B. and Q.R.R. overhead, at Oak Hill, Project NRS 429A, Route SA11, Peoria Co. E. Lieberman, ch. hy. engr.

Kentucky — Jan. 4, by State Hy. Comn., Frankfort, five 40 ft. rein.-con. deck girder bridge and approaches over Bullskin Creek on Finchville-Shelbyville Rd., S.P. 46C-B, Shelby Co.

†**Washington**—Jan. 4, by Pub. Rds., 316 New Post Office Bldg., Portland, Ore., bridge over Laughing Water Creek, Mount Rainier Natl. Park, East Side Hy., Project NR-5A, Lewis Co., incl. 4,050 cu.yd. excav. W. H. Lynch, dist. engr.

CONTRACTS AWARDED

California — State Hy. Comn., Sacramento, constructing steel, concrete bridge on concrete piers and abutments, over Kings River and grading, bituminous treating, crushed gravel or stone surfacing 1.2 mi. roadway approaches, Fresno Co., to Horn Co., 465 East Holt Ave., Pomona, $66,815. Noted Nov. 29.

Kentucky — State Hy. Comn., Frankfort, 2 bridges on Mt. Sterling-Frenchburg Rd., combined, NRH 158-DE-B, Montgomery Co., to W. C. Halstead, Shively, $31,997. **P.W.A.**

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, rein.-con. substructure for bridge over Boston, Revere Beach and Lynn R.R., to M. McDonough Co., Bway., Malden, $139,341; steel superstructure, to Lackawanna Steel Co., Box 951, Buffalo, N. Y., $121,987. **P.W.A.** Bids Nov. 20. Noted July 26.

New Jersey—State Hy. Comn., Trenton, constructing bridge in Morris Co., to Franklin Contg. Co., 20 Washington Pl., Newark, $60,759. Bids Dec. 17. Noted Dec. 6.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Albany Co., to R. D. Golden, Troy, $35,420 est. $37,849•••Oswego Co., to W. S. Johnson Building Co., Niagara Falls, $71,523 est. $77,310. **P.W.A.** Bids Nov. 20 and Dec. 4. Noted Nov. 8 and 22, under "Streets and Roads."

N. Y., Duanesburg—Wilson & English, general contractors, 50 Church St., New York, 150 tons structural steel for elimination of grade crossing, to American Bridge Co., 71 Bway., New York, for Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany. Noted Nov. 8, under "Contracts Awarded."

Va., Suffolk—State Hy. Dpt., Richmond, 174 ft. structural steel, bascule span bridge over Nansemond River, Nansemond Co., to Tidewater Constr. Co., Norfolk, $98,169. Bids Oct. 30.

STREETS AND ROADS

BIDS ASKED

Connecticut—Dec. 31, at office J. A. Macdonald, state hy. comr., Hartford, waterbound macadam paving 11,694 ft. North Main St. (River Rd.) and Plains Rd., Essex; 4 concrete bridges and rolled bank run gravel approaches

Constr. News page 254

†*Federal Government*

Streets and Roads (Continued)

1,000 ft. Lane St., Gilbert Ave. and Wooding St., Hamden; concrete encased I-beam bridge and rein.-con. approaches over Five Mile River on Route 136, Norwalk and Darien; rolled crushed gravel paving 1,050 ft. Weston.

†**Idaho**—Jan. 3, by Bureau P. Rds., Ogden, Utah, grading, draining, and gravel surfacing 4.313 mi. Warm River-Yellowstone Natl. Forest Rd., in Targee Natl. Forest, Fremont Co., incl. 65,100 cu.yd. unclassified and 1,520 cu.yd. unclassified excav. for structures. B. J. Finch, dist. engr.

Illinois—Jan. 4, by Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete paving 1.88 mi. Cicero-Ogden Ave. from Lombard Ave. to Cicero Ave., F.A. Project NRM 3A, Route 18, Sect. 7RY-NRMI, and 1.34 mi. Chicago, Elston Ave., Diversey to Ashland Aves., F.A. Project NRM 376B, Route 19, Sect. 19 NRM-1, both Cook Co.; 0.08 mi. Chicago Heights approach to C. & E.I. R.R. and V.H. T.Y. R.R. subway, SBI Route 22, Sect. 11S-4; 7.68 mi. SBL Route 70A, Sect. 110, Seneca South; 7.97 mi. north towards Seneca, SBI Route 70A, Sect. 111; 6.18 mi. Route 100, Section 109, Route 98, west of Havanna southwest to Marbletown; 6.82 mi. Route 100, Sect. 100, Marbletown Southwest through Bluff City; 6.83 mi. Route 100, Sect. 111, Browning to west of Bluff City; 4.83 mi. Route 119A, Sect. 119, Route 4, at McLean west of county line; 0.75 mi. Route 140, Sect. 109X, from B. and O. R.R. on Main St. in Morris City east to Route 1; 0.25 mi. approaches to Missouri Pacific R.R. subway at Gale, Route 150, Sect. 133X; graveling or crushed stone surfacing 3.74 mi. F.A. Project NRS 446A, Route SA20, Sect. 12GNRS, Route 144, East of West Frankfort to Hanaford, Franklin Co.; 3.06 mi. Route 146E, Vienna to Pond, NRS 415A, Route SA6, Sect. 8G-NRS, Johnson Co.; 1.21 mi. Dahinda to Route 91, F.A. Project NRS 437A, Sect. SA15, Sect. 22GNRS, Knox Co.; 2.4 mi. Route 20 East of McHenry to Fox River, NRS 362A, SA23, Sect. 9GNRS, McHenry Co.; 8.01 mi. F.A. Project NRS 343B, Route SA5, Sect. 9GNRS, Schuyler and Adams Counties; bituminous filled brick on concrete paving 1.18 mi. relocation west of Peoria, SBI Route 8, Sect. 10R. E. Lieberman, ch. hy. engr.

Kansas—Jan. 4, by State Hy. Comn., at office of County Clerk, Osborne, earthwork, culverts, curbing, guttering, sand gravel surfacing, concrete paving, bituminous filled brick paving, roadside improvements on 19.997 mi. hys. in Cheyenne, Ellis, Thomas, Trego, Osborne, Norton, Decatur and Rawlins Counties.

Kansas—Jan. 5, by State Hy. Comn. at office County Clerk, Hutchinson, earthwork, culverts, bituminous mat. surfacing, roadside improvements, concrete paving, sand gravel surfacing 14.086 mi. hys. in Sumner, Sedgwick, Pawnee and Stafford Counties.

Kansas—Jan. 9, by State Hy. Comn., at office of County Clerk, Fort Scott, concrete paving, roadside improvement, earthwork, culverts on 5.97 mi. hys. in Miami, Montgomery, Crawford, Bourbon and Anderson Counties.

Kentucky—State Hy. Comn., Frankfort, rescinded contract that was awarded May 10, 1934, for grading 7.339 mi. Centertown-Island Rd., S.P. 130-AG, Ohio Co. Bids Oct. 6, 1933. Noted May 17, under "Contracts Awarded."

Kentucky — Jan. 4, by State Hy. Comn., Frankfort, high type surfacing 0.808 mi. U. S. Route 62, NRHM 196 BS, and NRM 147 ES, Hardin Co.; 0.407 mi. Bardstown Rd., Louisville, NRM 18 B1 B2-S, Jefferson Co.; 0.256 mi. Main St., NRM 148 D-S, Lincoln Co.

Louisiana — Jan. 9, by State Hy. Comn., Baton Rouge, grading, surfacing approaches to Rome Ferry Bridge, 0.777 mi. Project 590-B. NRS 236-B, Livingston Parish. H. B. Henderlite, state hy. engr.

Maryland—Dec. 31, by State Roads Comn., widening, bituminous course Spec. C, on concrete resurfacing, 1.73 mi. Contr. M-185-1-39, Federal Aid Project NRH 351, Montgomery Co.

Pennsylvania—Jan. 4, at office S. S. Lewis, secy. Hys., Harrisburg, rein.-con. paving 10,668 ft. and bituminous surface course Spec. E on variable width base, grading, drainage of shoulders 250 ft. R-120, Sect. 9, North Versailles Twp., Allegheny Co., involving 74,823 cu.yd. Class 1 and 954 cu.yd. Class 2 excav.; rein.-con. paving 1,585 ft. Kettle St., Altoona, Blair Co., 1,461 cu.yd. Class 1 and 53 cu.yd. Class 2 excav.; bituminous surface, Spec. E on native or broken stone paving, incl. 3 drainage structures and railroad overhead bridge 12,737 ft. R-15119, Sect. 2, West Caln, West Brandywine and Valley Twps., Chester Co., 18,079 cu.yd. Class 1, 1,819 cu.yd. Class 2, and 7,708 cu.yd. borrow excav.; dual-type two 10 ft., outside lanes of rein.-con. pavement and 10 ft. center lane of bituminous surface Spec. E on broken stone base paving 19,566 ft. hy. and rein.-con. paving 106 ft. hy. at intersection, stone paving 485 ft. hy. and bituminous surface Spec. E on broken stone base paving 665 ft. R 139, Swatara Twp., Dauphin Co., 99,642 cu.yd. Class 1, 507 cu.yd. Class 2 and 557 cu.yd. borrow excav. rein.-con paving 20 to 45 ft. wide 11,106 ft. hy., rein.-con. widening 1,577 ft. hy. bituminous surface Spec. E. on stone base paving 517 ft. hy., and rein.-con. paving 25 ft. 880 ft. R-23051, Spur E, App. 983, Haverford and Upper Darby Twps., Delaware Co., 51,524 cu.yd. Class 1, 983 cu.yd. Class 2 and 2,832 cu.yd. borrow excav.; rein.-con. widening, incl. replacement of existing pavement, also grading, drainage 9,622 ft. R-142, R-215, Sect. 1, Lancaster and East Lampeter Twps., Lancaster Co., 7,408 cu.yd. Class 1 and 267 cu.yd. Class 2 excav.; new vitr. brick paving and relaid granite block paving 651 ft. Chestnut St., Sect. 4, rein.-con. paving 2,423 ft. hy. and relaid granite block and bituminous surface, Spec. A on new and existing concrete paving 98 ft. hy. Ridge Ave., Sect. 1, bituminous surface Spec. A on plain concrete paving 2,427 ft. Ridge Ave., Sect. 2, bituminous surface Spec. A on new and existing concrete paving, vitr. brick guttering 2,746 ft. Ridge Ave., Sect. 3; bituminous surface, Spec. A on plain concrete paving 1,975 ft. hy. and bituminous surface Specs. A and E on existing base and a broken stone base paving 70 ft. Frankford Ave., Sect. 2, 4,047 cu.yd. Class 1 excav.; rein.-con. paving 5,133 ft. hy. and bituminous surface course Spec. E on broken stone paving 157 ft. hy. Frankford Ave. Sect. 3, 8,177 cu.yd. Class 1 and 1,094 cu.yd. Class 2 excav.; rein.-con. paving 7,754 ft. hy. and bituminous surface, Spec. E on broken stone paving 113 ft. Frankford Ave. Sect. 4, R-150, Bensalem Twp., 11,882 cu.yd. Class 1 and 175 cu.yd. Class 2 excav., all foregoing in City of Philadelphia, Philadelphia Co.; rein.-con. paving 5,164 ft. R-639, Sect. 7, Penn and Hempfield Twps., Jeannette Borough, Westmoreland Co., 11,232 cu.yd. Class 1, 1,426 cu.yd. Class 2 and 14,692 cu.yd. borrow excav.

Tex., Beeville—Bee Co. soon takes bids road improvement, grading, hardsurfacing, $160,000. Bee County Eng. Dpt., Beeville, engrs.

CONTRACTS AWARDED

California — State Hy. Comn., Sacramento, grading, asphaltic concrete paving 1 mi. hy. in city of Tulare, Tulare Co., to Basich Bros., 20,550 Normandie Ave., Torrance, $34,202; grading, oiling 10.5 mi. hy. between point 22.8 mi. north of junction of Routes 21 and 29, Lassen and Sierra Counties, to Harms Bros., 522 21st Ave., Sacramento, $82,984. Bids Dec. 12, awarded Dec. 17.

Calif., San Jose—City, repaving right-of-way where street car tracks will be removed. Work under supervision of W. Popp, city engr. with SERA forces. Est. total cost $73,513, $28,500 for materials only.

Indiana—State Hy. Comn., Indianapolis, grading, crushed stone surfacing 1.848 mi. roads in Morgan Co., 16 ft., to M. R. Polk & Co., Oaktown, $30,524. Est. $31,814. Bids Nov. 27. Noted Nov. 22.

Indiana — State Hy. Comn., Indianapolis, stabilized material surfacing 9.621 mi. Owen Co., 20 ft., to Clark, Duvall & Sparling, Flora, $72,071. Est. $99,473. Bids Nov. 27. Noted **Nov. 22.**

Ind., Brazil—Clay Co., L. H. Schopmeyer, aud., bituminous mulch surfacing 7.1 mi. roads through Perth, 20 ft., to W. H. Rupert, Brazil, $22,210.

Ind., Brownstown—Jackson Co., D. W. Thompson, aud., bituminous mulch paving 7.7 mi. roads at Tampico, 18 ft., to Hancock & Kieffer, Seymour, $23,300.

Ind., New Albany—Floyd Co., C. F. Finch, aud., bituminous mulch surfacing 8 mi. county roads through Navilleton, 20 ft., to Straw & Seegal, New Albany, $25,100.

Kansas—State Hy. Comn., at office County Clerk, Hoxie, (**P. means Project**) to Cook & Waddell, Ottawa, earthwork and culverts 1.785 mi. P. 23-14B-NRH 494-B, $5,872; 2.062 mi. P. 23-15 NRH 494 C, Sheridan Co., $14,984; 0.706 mi. P. 40N-13-NRM 371-H, $28,167; 0.706 mi. P. 40 N13-NRM 371-H, $130, both Rooks Co.***to Stamey & Tidd, Hutchinson, roadside improvement 0.734 mi. P. 1-15-NRH 286-C, Ellis Co., $2,581; 2.062 mi. P. 23-15-NRH 494-C, Sheridan Co., $102; 7.785 mi. P. 23-14B-NRH 494-B, Gove Co., $95***to E. D. Reed, Clay Center, ten 30 ft. rein.-con. deck girders P 23-15 NRH 494-C, Sheridan Co., $20,420***to San-Ore Constr. Co., McPherson, sand gravel surfacing 10 mi. P. 1-15-6315, Ellis Co., $2,640. Grand total $74,991. **P.W.A.** Bids Dec. 7.

Kansas—State Hy. Comn. at office County Clerk, Independence (**P. means Project**), to A. G. Sherwood, Independence, concrete paving 1.266 mi. P. 75-5-PWS 8, Montgomery Co., $32,645***to M. W. Watson, Natl. Bank of Topeka Bldg., Topeka, 0.521 mi. P. 73W-10-PWS 10, Neosho Co., $13,196; 0.571 mi. P. 73W-11-PWS 11, Allen Co., $15,525***to Cook Gardens, Ottawa, roadside improvement 1.266 mi. P. 75-5-PWS 8, Montgomery Co., $337; 0.521 mi. P. 73W-10-PWS 10, Neosho Co., $159; 0.571 mi. P. 73W-11-PWS 11, Allen Co., $91; 4.691 mi. P. 96-26 PWS 9, Greenwood Co., $779***to Chandler Landscape & Floral Co., 101 West 47th St., Kansas City, Mo., 0.408 mi. P. 160-38 NRH 199 A, $1,865 ****0,681 mi. P. 160-38 NRH 199 G, $993**** 1.266 mi. P. 75-5-NRH 23A, $797, all foregoing Montgomery Co.***to Scherrer & Bennett, Kansas City, Mo., earthwork and culverts 4.691 mi. P. 96-26-PWS 9, Greenwood Co., $38,703 ***to Cook & Cone, Ottawa, chat surfacing 14 mi. P. 160-43-6319, Crawford Co., $2,709; 5.2 mi. P. 160-44-6320, Crawford Co., $1,186 ***to A. V. Eulich, Kansas City, Mo., chat surfacing 1.2 mi. P. 160-4-6317, Montgomery Co, $326; 10.8 mi. P. 160-41-6318, Labette Co., $2,873. Grand total $112,184. **P.W.A.** Bids Dec. 11. Noted Dec. 6.

†*Federal Government.*

Constr. News page 255

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JANUARY 31, 1935

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FEBRUARY 7, 1935

Streets and Roads (Continued)

Kentucky—State Hy. Comn., Frankfort, grading, draining 1.857 mi. Hardinsburg-McQuady Rd., S.P. 45-AG, Breckinridge Co., to R. L. Johnson & Co., Lewisport, $5,643***grading, draining 6.177 mi. Hodgenville-Campbellsville Rd., S.P. 41‡ AG, Larue Co., to Highland Co., 644 Baxter St., Louisville, $22,077. Bids Dec. 7. State Hy. Comn., Frankfort, held in abeyance project for grading, draining 11.016 mi. Manchester-Booneville Rd., S.P. 31 AG, Clay Co. **P.W.A.**

Kentucky—State Hy. Comn., Frankfort, grading, draining 4.971 mi. Salem-Golconda Rd., S.P. 73 BG, Livingston Co., to Ralph E. Mills Co., Inc., Frankfort, $34,157. Bids Nov. 23. Noted Nov. 15.

Maryland — State Roads Comn., Baltimore, grading, drainage for dual hy. along 4.25 mi. Contr. H-187-48, Federal Aid Project NRH 335-F, Harford Co., to Potts and Callahan, 1st Natl. Bank Bldg., Baltimore, $116,299. **P.W.A.** Bids Sept. 25. Noted Sept. 20.

Missouri—State Hy. Dpt., Jefferson City, to Nevada Constr. Co., Nevada, grading 2.163 mi. Saline Co., $14,808; 3.781 mi. Carroll Co., $7,760***to Richmond Constr. Co., Advance, gravel in stockpiles, on Kinder-Fisk Rd., Route 51, Sect. M1, $7,696; on same road, Route SK, Sect. M11, $525, both Stoddard Co.; 3 mi. Pemiscot Co., $7,139; 0.25 mi. New Madrid Co., $9,160; 0.094 mi. Bollinger Co., $3,539***to Edmondson & Doty, Cassville, gravel in stockpiles, Blomeyer-Delta Rd., $2,607; on Arbor-Green Cox Rd., $1,810; on Dutchtown-Whitewater Rd., $772, all foregoing Cape Girardeau Co.***to Henderson Constr. Co., Richmond, grading 3.966 mi. Route 275-St. Joseph Rd., Sect. 489A, $19,407; 4.009 mi. Sect. 489B, same road, $31,575; 3.503 mi. Sect. NRS 489C, same road, $17,698, all foregoing Andrew Co.***to F. T. O'Dell, Hannibal, 0.165 mi. Iron Co., $2,452; 0.207 mi. Shelby Co., $11,093*** to R. Zink, Appleton, 7 mi. Randolph Co., $5,914***to J. L. Pohl, Nevada, Cape Girardeau Co., $1,803***to C. H. Atkinson Paving Co., Chillicothe, 0.024 mi. Howard Co., $6,605*** to O. H. Schmidt, Inc., St. Joseph, 4.041 mi. Nodaway Co., $10,309***to E. F. DeLancy, Holcomb, 4.17 mi. New Madrid Co., $6,441***to M. E. Gillioz, Monett, 1.175 mi. Butler Co., $72,261***to T. J. Morris, St. Joseph, 3.604 mi. Atkinson Co., $15,016. Grand total $256,390. **P.W.A.** Bids Nov. 23.

Missouri — State Hy. Dpt., Jefferson City, bridges in Shelby Co., to Firman T. O'Dell, Hannibal***Howard Co., to C. H. Atkinson Paving Co., Chillicoth***culvert in Washington Co., to H. C. Grunwald, University City***bridges over Drainage Ditch 7, and over Drainage Ditch 6, New Madrid Co., in Bollinger Co. and in Pemiscot Co., to Richland Constr. Co., Advance ***bridges over Little Raft Slough, Sta. 31 plus 00 and Sta. 46 plus 78, Butler Co., to M. E. Gillioz, Monett***bridges in Barry and Saline Counties, to Nevada Constr. Co., Nevada. **P.W.A.** Bids Nov. 23.

New Jersey—State Hy. Comn., Trenton, grading, rein.-con. paving 1.785 mi. road in Passaic and Morris Counties, and 1.497 mi. in Morris Co., to J. P. Burns, Dumont, $188,573 and $228,548 respectively***3.47 mi. Bergen Co. and 2.814 mi. Bergen Co., to G. M. Brewster, Bogota, $456,703 and $327,491 respectively. Grand total $1,210,315. **P.W.A.** Bids Dec. 17. Noted Dec. 6.

New York—A. W. Brandt, comr. Hys., Albany, graveling 1.22 mi. Albany Co., to M. Christo, Rensselaer, $10,261 est. $11,142*** 5.53 mi. St. Lawrence Co., to A. F. McConville, Ogdensburg, $36,213 est. $42,830***5.06 mi. Monroe Co., to F. W. Crouch, Rochester, $24,969 est. $36,672***5.13 mi. Delaware Co., to O'Day & Ambrose, Binghamton, $47,430 est. $61,222***7.58 mi. Albany and Schenectady Counties, to Madison County Constr. Co., Solsville, $288,418 est. $354,307***3.34 mi. Clinton Co., to Spellman-Oliver Co., Chateaugay, $69,044 est. $84,270***6.22 mi. Orange Co., to H. J. Osborne Co., Inc., Pleasantville, $31,529 est. $41,904***bituminous treated broken stone paving 4.35 mi. Schoharie Co., to E. G. DeLia & Co., New Hartford, $63,558 est. $69,605***grading 0.82 mi. Kings and Queens Counties, to New York and New Jersey Corp., 60 East 42nd St., New York, $411,915 est. $557,824***2.88 mi. Franklin Co., to K. J. Premo, Massena, $27,040 est. $32,211***2.36 mi. Ulster Co., to Johnson, Drake & Piper, Inc., Freeport, $149,324 est. $167,707***0.27 mi. Orange Co., to Curtis & Harper, Inc., Newburgh, $57,919 est. $64,928***4.38 mi. Orleans Co., to Rochester Materials Corp., 221 Mount Hope Ave., Rochester, $24,754 est. $33,477***2.85 mi. Columbia Co., to Keil Stone & Gravel Corp., Hudson, $21,652 est. $28,376. Grand total $1,264,026. **P.W.A.** Bids Nov. 20 and Dec. 4. Noted Nov. 8 and 22.

N. Y., Buffalo—Bd. Supervs. Erie Co., to Arrow Constr. Co., Inc., 217 Leroy Ave., bridges on Burton Rd., Orchard Park, $9,171; on Polish Hill Rd., Boston, $23,437***to B. Cefali, South Wales, on Murry Rd., Colden, $23,939; on Abbott Rd., Lackawanna, $20,000; on Keller Rd., Eden, $15,237***to Valentine Zilenski, 20 Roetzer Ave., on North St., Concord, $5,533; on Genesee Rd., Sardina, $5,100***to W. A. Vail, bridge in Collins, $7,630***to O'Day Eng. Corp., River Rd., Tonawanda, on Villa Rd., in Amherst, $13,606. Grand total $123,653. Bids Nov. 13. Noted Nov. 1.

Constr. News page 256

Pennsylvania—At office S. S. Lewis, secy Hys., Harrisburg, bit. surface course Spec. "E" surfacing 0.81 mi. present brick pavement Route 25-20, Erie, Erie Co., to J. & M. Doyle Co., 457 West 3rd St., Erie, $19,770***rein con. paving also some native stone or modified broken stone base paving 1.22 mi. Route 186 Sect. 4, Somerset Co., to A. C. Rotney, Elizabeth, $65,337***bit. surface course, Spec. "E" on broken stone base, extending rein.-con. culvert on 1.43 mi. Route 157, Sect. 10, South Whitehall Twp., Lehigh Co., to General Paving Co., 616 Muhlenberg St., Allentown, $41,000 ***bit. surface course Spec. "E" on native stone base paving, and grading approach 1.83 mi. Route 951, Sect. 1, Jefferson Twp., Lackawanna Co., to H. B. Sproul Constr. Co., 7 Olive St., Scranton, $41,539. Grand total $167,652. **P.W.A.** Bids Dec. 7. Noted Nov. 29.

Texas—G. Gilchrist, state hy. engr., Austin, grading, drainage structures 6.878 mi. State Hy. 29, NRS 781-A, Gonzales Co., to Cage Bros., Bishop, $24,353. Est. $30,000. **P.W.A.** Bids Nov. 26.

Ontario — R. A. Campbell, deputy minister Dpt. Northern Development, Toronto, clearing, grading, etc., 17 mi. Provincial Hy. Phelps to Big Jocko R. on North Bay-Temiskaming Rd., North Bay, to Glesson-Martin & Co., Ltd., Central Chambers, Elgin St., Ottawa. Est. $50,000.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., San Jose—L'Lasgas-Uvan Water Conservation Dist., plans election in January (probably Jan. 22) to form district comprising 38,000 acres in southern section of county.

Ind., Delphi — City making plans cleaning, straightening ditches, channel improvements. $20,500. T. R. Arnold, Delphi, clk.

Ind., Hartford City—City making plans channel improvements of Lick Creek, for 8 mi. $12,700. Von Bramer, Hartford City, clk.

Ind., Muncie—City, W. J. Daniel, supt., plans straightening and widening White River. $16,000.

Ind., Peru—City, H. Worl, clk., making plans channel improvements for ditches. $15,360.

N. J., Spring Lake and Sea Girt—Joint Bd. Councils, soon take bids constructing jetties to form dam and lake. $35,000. P.W.A. loan granted. Sincerbeau, Moore & Shinn, Manasquan, engrs. Noted Oct. 19, 1933.

Mass., Winthrop—Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, plans concrete seawall from Cherry Island Bar to present sea wall on Winthrop Parkway. $170,000 or more.

Neb., Columbus and North Platte—Platte Valley Power & Irrigation Dist. and Loup River Public Power Dist., plan 2 large hydro-electric projects to connect the 2 together so that power will be available for both at all times. $2,400,000 loan to be asked from P.W.A.

Pennsylvania — Boroughs of West Reading and Wyomissing jointly have preliminary plans in progress for improvement of Schuylkill River front and general flood control project. To exceed $17,500. **Maturity indefinite.**

Tex., Brownsville—Cameron Co. Water Impvt. Dist. 11, plans irrigation and drainage. $168,500 loan approved by P.W.A. Bd.

Tex., Port Arthur—City, c/o R. L. Cooper, mgr., P.W.A. allotment rescinded for $102,000 for seawall completion, protection from high waves. J. B. Converse & Co., Corpus Christi and Port Arthur, engrs. Noted June 15, 1933.

BIDS ASKED

Neb., Columbus and Genoa—Jan. 4, by Loup River Public Power Dist., C. B. Fricke, pres., Columbus, completing syphon near Genoa and weirs near Columbus, incl. 57,000 cu.yd. backfill, 119 tons steel sheet piling, 10,200 cu.yd. concrete poured against 246,000 sq.ft. for work and reinforced with 558 tons steel.

Neb., North Platte—Jan. 8, by Platte Valley Power & Irrigation Dist., North Platte, constructing Sects. D and E of Supply Canal.

Neb., North Platte—Jan. 11, by Platte Valley Power & Irrigation Dist., North Platte, constructing Sects. A and B, Supply Canal between Diversion Dam and Sutherland Reservoir of Sutherland Project, Keith Co., incl. 2,900,000 cu.yd. earth excav., 100,000 cu.yd. rolled embankment, 9,300 cu.yd. rein.-con. structures and canal lining 213,000 ft. B.M. bridge lumber, 500 tons reinforcing steel canal lining with alternate of 450,000 sq.ft. gunite canal lining, etc. Contracts awarded Dec. 5, bids rescinded. Noted Dec. 20, under "Contracts Awarded."

†*Federal Government.*

Earthwork, etc. (Continued)

Pa., Birdsboro—See "Contracts Awarded."

Tex., Edinburg—Jan. 7, by Hidalgo Co. Water Control & Imprvt. Dist. 6, c/o A. L. Cramer, pres. (Engleman Gardens) concrete lining canals or laying concrete pipe in canals, incl. 97,041.97 ft. canal lining, 43,990 ft. 10- to 30-in. concrete pipe, three 30 in., one 24 in. gates, two 20 in., two 18 in., two 16 in., two 14 in., eight 12 in. and three 10 in. gates; 58 field gates and meters, 88 bases of vents, 30 well bases, 1 pumping plant No. 9, 1 pumping plant No. 10. $125,000. A. Tamm, Harlingen, engr.

†**Tex., Houston** — Jan. 14, by U. S. Eng., Trust Bldg., Galveston, dredging 1,510,000 cu. yd. from Houston Ship Channel from Sta. 520.00 to Sta. 830.00 and from Sta. 1245.00 to and including turning basin.

B. C., Powell River—Jan. 8, by Secretary Dpt. P. Wks., Ottawa, repairing Breakwater 2, North Dist. $30,000. K. M. Cameron, Ottawa, Ont., engr.

CONTRACTS AWARDED

Calif., San Jose—Directors Santa Clara Valley Water Conservation Dist., Grant Bldg. Dec. 14, Stevens Creek dam and spillway, involving earthfill structure with concrete facing on upstream side 600 ft. long at crest maximum height 100 ft., also constructing Almaden Dam, Almaden Spillway, Almaden-Calero Conduit, Calero Dam, Calero Auxiliary Dam and Calero Spillway with appurtenant works, dams are earth-fill type with upstream face, concrete paved, the Almaden Dam will have crest of 500 ft. and maximum elevation 90 ft., Calero Dam 900 ft. wide at crest, maximum height 93 ft., to F. O. Bohnett, Campbell and D. McDonald, 204 23rd St., Sacramento, $174,670 and $372,020 respectively est. $415,000 and $339,000 respectively.

†**New York**—U. S. Eng., 2nd Dist., 39 Whitehall St., New York, dredging 222,000 cu.yd. from entrance channel to Great Kills, Staten Island, to J. A. Boyle, New York, $28,860. Bids Dec. 10. Noted Dec. 6.

Pa., Birdsboro — Borough, Borough Council, SERB project approved, allotted $61,000 for resumption of operations on Hay Creek Flood Control Project in borough, deepening creek channel, lining walls with stone and strengthening bridges, also widening channel. Project was originally started as a CWA project but work was abandoned several months ago. Work will be resumed immediately with day labor. Borough Engineering Dpt., engrs.

Tex., Palacios—Palacios Seawall Comn., constructing seawall, pavilion, bathhouse, pier and protecting breakwater, to Austin Bridge Co., 1811 Clarence St., Dallas, $100,952 (tentative award). **P.W.A.** Bids Dec. 6.

UNCLASSIFIED

PROPOSED WORK

Ark., Ozark—COAL MINING—Philpott Valley Coal Co., c/o K. Kershaw, pres., plans coal mining development. $40,000.

Calif., Hayward—NATATORIUM—City, plans rein.-con. natatorium in Memorial Park. P.W.A. allotted $75,000 to assist in financing of same. Bond election for $52,500 to be held shortly. Noted Feb. 1.

Calif., Palo Alto—STREET LIGHTING SYSTEM—City plans extensions to street lighting system, both bracket lights and electroliers will be installed. To exceed $25,000.

Me., Portland—LUMBER DOCK, etc.—Brown Co. plans lumber dock and storage. $30,000 or more. Architect not appointed.

Mass., Cambridge—RAILROAD—Boston Elevated Ry. Co., 31 St. James Ave., Boston, and city of Cambridge, R. M. Russell, mayor, plan continuation of rapid transit railroad from Lechmere Sq. to North Cambridge car barn and construction of subway from Harvard Sq. to North Cambridge. $10,000,000. Federal funds will probably be asked by city.

Minn., Bemidji—HANGAR, etc.—Municipality plans by F. C. Klawiter, 2077 Fairmont Ave., St. Paul, plans hangar and airport improvements. $40,000 or more.

Mo., Higginsville—SWIMMING POOL—City, R. A. Huscher, mayor, soon takes bids rein.-con. swimming pool, bathhouse and sewer extensions. $39,300. **P.W.A.** M. N. Layne, city engr. Perkins Laboratories, 2584 Laurel St., Omaha, Neb., engrs. P.W.A. project. Noted Nov. 23, 1933.

Nebraska—PARK—Devils Nest Natl. Park and Bird Sanctuary, promotion 25,000 acres national park, extending 12 mi. along Missouri River in Knox Co., 12 mi. from Bloomfield. Congressman K. Stefan, Norfolk, assisting to make plans.

N. Y., Webster—TRANSMISSION LINES—Rochester Gas & Electric Co., 89 East Ave., Rochester, plans extending power transmission lines at and near here. $50,000.

O., Springfield — YARDS and TRACK CHANGES—Springfield Suburban R.R. Co., 236 Cliff St., plans yards and track changes, Main, Center and High Sts. To exceed $30,000. **Maturity indefinite.** Private plans.

†*Federal Government.*

Oregon — DISTRIBUTION SYSTEM — See "Public Buildings."

South Carolina—POWER DEVELOPMENT—Lyles-Ford Tri-County Authority, L. G. Young, chn., Union, will apply for P.W.A. loan to finance construction 4 large dams, 1 at Whitmire, another across creek in Goshean Twp., another on Tiger River and 4th near Lyles Ford, 3 of dams will be 96 ft. high, to create poundage of 25,000 acres and develop 54,000 hp. in Newberry, Union and Fairfield Counties. $8,500,000. Preliminary work being actively carried on necessary for application to P.W.A.

Tenn., Chattanooga—BROADCASTING STATION—D. J. Connolly, Read House, has asked Federal authorities for permit to erect short-wave station, if obtained work will be started at once. $75,000.

Tex., Big Spring—SWIMMING POOL, etc.—City indefinitely postponed taking bids for rein.-con. municipal swimming pool and bath house, filter plant. $30,000. P.W.A. project. Peters, Strange & Co., Crim Bldg., Longview, engrs. and archts. Noted Nov. 22.

Man., Winnipeg — HYDRO EXTENSION — Manitoba Power Comn. preparing plans and takes bids early in 1935 for hydro extension to Red Valley Dist.

N. B., St. John—TANKS—Imperial Oil Co. Ltd. plans constructing two 28,000- bbl. tanks on Broadway Ave.

Ont., London — SWIMMING POOL — Public Utilities Comn., E. V. Buchanan, genl. mgr., plans concrete swimming pool in one of the civic playgrounds.

BIDS ASKED

Ky., Covington—RAILWAY—See "Contracts Awarded."

†**Md., Aberdeen**—NIGHT LIGHTING—Jan. 2, by Con. Q.M., Aberdeen Proving Ground, constructing and completing night lighting installation at Phillips Field, Aberdeen Proving Ground.

New York—FIELD HOUSE, etc.—Jan. 3, by Superintendent P. Wks., c/o Commissioner Architecture, State Office Bldg., Albany, completing construction work for field house and refreshment stand, on Alley Pond Rd., Grand Central Parkway, Hillside Park, Grand Central Parkway, Queens Boro.

O., Norwood—SWIMMING POOL—See "Contracts Awarded."

Utah—RAILROAD—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Woodlawn—MAUSOLEUM—H. H. Larsen, general contractor, 64 South Park, San Francisco, electrical work for rein.-con. mausoleum, for Woodlawn Cemetery Assn., Woodlawn, to American Electric Co., 465 Bryant St., San Francisco. Noted Nov. 8, under "Contracts Awarded."

Ky., Covington—RAILWAY—Cincinnati, Newport & Covington R.R. Co., Covington, improvements to street railway, track work, etc., new tracks Montague St., $6,000 and improvements Pike St., $23,000, day labor.

O., Norwood—SWIMMING POOL—Municipality, swimming pool and shelter, day labor. $30,000. FERA project.

R. I., Newport—WHARF—Newport Oil Corp., Long Wharf, Newport, 250 ft. pile, timber wharf, 12 ft. wide, to Elliott & Watrous, Inc., 87 Globe St., Providence. Private plans.

Utah—RAILROAD—Los Angeles & Salt Lake R.R. Co., subsidiary Union Pacific R.R. Co., H. C. Mann, ch. engr., 1416 Dodge St., Omaha, Neb., constructing 11.3 mi. spur track from Desert Mound to Iron Mountain, separate contracts. Interstate Commerce Commission approved project. Noted Nov. 22.

MATERIALS AND EQUIPMENT

PROPOSED WORK

COPPER PIPE—**Santa Cruz, Calif.**—S. A. Evans, city clk., will purchase in open market, 1,950 ft. ¾ in. copper service pipe 0.641 lbs. lin. ft.; seventy ¾ in. corporation stops; seventy ¾ in. ground key curb stops, seventy ¾ in.; quarter bend couplings; seventy ¾ in. stream line copper couplings; seventy ¾ in. three-part Union Copper to copper. Bids Dec. 3 rejected.

DUMP TRUCKS, etc.—**New Britain, Conn.**—City, P. Wks. Dpt., plans purchasing 2 dump trucks, $9,000; 6 ton gas roller, $3,000. G. J. Molleur, city engr.

FIRE HOSE — **Hartford, Conn.** — City, Fire Dpt., plans purchasing fire hose, $4,000, pumper $13,500, exclusive of chassis. R. B. Posey, research dir.

RAILS — **Chicago, Ill.** — Purchasing Agent Chicago, Burlington & Quincy R.R. Co., Chicago, Ill., plans purchasing 10,000 tons 112 lb. rails.

RAILS, etc.—**Baltimore, Md.**—Chesapeake & Ohio R.R., C. W. Johns, ch. engr., Richmond, Va., plans purchasing 40,000 tons of rail for replacements during 1935.

TRUCK—**Minneapolis, Minn.**—Hennepin Co., A. P. Erickson, aud., plans purchasing one 4-wheel drive truck. W. E. Duckett, co hy. engr.

DUMP TRUCK—**Owatonna, Minn.**—City, M. E. Kasper, city clk., bids probably in April, one 2½ ton dump truck. A. C. Smith, city engr.

GRAVEL — **Ackerman, Miss.** — Bd. Supervs. Choctaw Co., rejected bids Dec. 3, 3,000 tons gravel for use on county roads. Will purchase in open market when and if needs develop. Noted Nov. 22.

TANKS—**Buffalo, N. Y.**—Mohican Service Station, 2329 Bailey Ave., granted permit to install four 500 gal. steel storage tanks at service station, 469 Seneca St. To exceed $1,000.

TANKS—**Buffalo, N. Y.**—H. Weaver, 170 Michigan Ave., filed application for permit to install several 500 gal. steel storage tanks at service station, 170 Michigan St. To exceed $1,000.

RAILS and TRACK FITTINGS—**New York, N. Y.**—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., bids after Jan. 1, quantity of steel rails and track fittings.

TANKS — **St. Louis, Mo.** — B. Baseler, 104 South Bway., plans installing three 1,000 gal. underground steel tanks for gasoline for filling station at 104 South Bway.

TANKS—**St. Louis, Mo.**—Lenore Cohen, 2501 Cass Ave., applied for permit to install three 550 gal. underground steel tanks for gasoline at automobile service station, 2501 Cass Ave.

TANKS—**St. Louis, Mo.**—F. Dallavalle, 5882 Delmar Blvd., applied for permit to install three 2,000 gal. underground steel tanks for gasoline for automobile service station, 803 North Garrison Ave.

TANK — **St. Louis, Mo.** — Heine Boiler Co., 5319 Shreve Ave., applied for permit to install one 15,000 gal. steel tank for storage of fuel oil for private use at 5319 Shreve Ave.

TANK — **St. Louis, Mo.** — Manhattan Real Estate Co., 3434 Chouteau Ave., applied for permit to install one 2,500 gal. underground tank for gasoline at 3434 Chouteau Ave.

TANKS—**St. Louis, Mo.**—Superior Stations, Inc., 3606 Gravois Ave., applied for permit to install three 1,000 gal. underground steel tanks for gasoline for service station, 3315-17 Page Blvd.

TANK—**St. Louis, Mo.**—Square Deal Oil Co., 6339 Easton Ave., applied for permit to install three 500 gal. underground steel tank for gasoline at automobile service station, 918 North 20th St.

RAILS, etc.—**Cleveland, O.**—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., plans purchasing 30,000 tons of rails for 1935 replacements.

RAILS—**Cleveland, O.**—New York, Chicago & St. Louis R.R. Co., A. V. Harvey, ch. engr., Terminal Tower Bldg., plans purchasing 10,000 tons rails for 1935 replacements.

STEEL TANKS—**Phila., Pa.**—Stokes & Smith Co., Summerdale Ave., granted permit to install 6 steel tanks for storage of phenol at Summerdale Ave. and Reading R.R. $2,000.

RAILROAD EQUIPMENT—**Montreal, Que.**—Canadian Pacific R.R., J. M. R. Fairbairn, ch. engr., Montreal, appropriates $20,000,000 for 1935 equipment-purchasing program. This will include locomotives, passenger, express, baggage and freight cars, ties and telegraph supplies, made necessary by retrenchments of the last 4 years.

BIDS ASKED

CABLE—**Los Angeles, Calif.**—Jan. 4, by D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing, delivering 4,280 ft. 750,000 CM, 35,000 volt, 3-conductor, lead covered, paper insulated, oil impregnated cable, Spec. 1568. To exceed $2,000.

†DUMP TRUCK—**Vicksburg, Miss.**—Jan. 3, by U. S. Eng., Box 7665, 1 auto dump truck, f.o.b. Vicksburg.

†STRAND WIRE, etc.—**Corning, Mo.**—U. S. Eng., City Natl. Bank Bldg., Omaha, Neb., taking bids 18,000 ft. ¼ in. strand wire consisting of 7 11 gal. annealed steel wires twisted together, strength 4,250 lb. on spools or reels, approximately 3,000 ft. each, Lot 1; 500 lb. iron or steel fence wire staples, 1½ in. long, Lot 2; 900 lb. common wire nails, 20d, 100 kegs, Lot 3; 800 lb. iron or annealed steel wire gal. in coils 11 lb. each No. 14, Lot 4; 215,000 sq.ft. wire mesh No. 9 gage, 54 in. wide, Lot 5, all f.o.b. Corning.

CAST IRON PIPE—**Corpus Christi, Tex.**—City, c/o J. R. Lowe, Gas Dpt., bids about Jan. 10, supplying 50,000 lb. 3-4 in. c.i. pipe.

CONTRACTS AWARDED

CAST IRON PIPE, etc.—**Oceanside, Calif.**—City Council, 2,842 ft. 6 in. and 2,444 ft. 4 in. c.i. pipe, two 6 in. and two 4 in. gate valves, two 6 in. wye branches and bends and four 6 in.-¼; four 6 in.-1/16; four 6 in.-1/32; six 4 in.-¼; four 4 in.-1/16; two 4 in.-1/32 bends, f.o.b. trenchside, to U. S. Cast Iron Pipe Co., 417 South Hill St., Los Angeles, $3,259. Bids Dec. 5, awarded Dec. 5. E. T. Duehren, City Hall, water supt.

CAST IRON PIPE, etc.—**Santa Cruz, Calif.**—S. A. Evans, city clk., 250 ft. 4 in. Class 150, c.i. pipe, B and S joints, 12 ft. lengths, ten 4 in. and four 12 in. double disc gate valves, to U. S. Pipe & Fdry. Co., Monadnock Bldg., San Francisco, $400•••70 rein.-con.

Constr. News page 257

Materials, etc. (Continued)

meter boxes for ¾ in. meters, fourteen 6 in. concrete adjustable valve boxes with top, box and sleeve, box width 12 in. height, to Forni Mfg. Co., 1379 62nd St., Oakland. $108*** 200 lb. ¾ in. braided hemp packing, 1,225 lb. Leadite or equal, 400 lb. pig lead, 25 lb. rope oakum, to R. E. Olson Co., 2033 87th Ave., Oakland. $189. Grand total $697. Bids Dec. 3, awarded Dec. 11.

CAST IRON PIPE—**Santa Monica, Calif.**—City, Commissioner Finance, City Hall, to National Cast Iron Pipe Co., 625 South Western Ave., Los Angeles, 6,000 ft. 4 in. bell and spigot c.i. pipe 45c.; 10,000 ft. 6 in. 69c.; 1,300 ft. 8 in. $1.03, foregoing Class 150; and 1,300 ft. 8 in. Class 200, pipe at $1.12.

STEEL RAILS—**Chicago, Ill.**—Northern Pacific R.R. Co., B. Blum, ch. engr., St. Paul, Minn., 6,000 tons steel rails, to Illinois Steel Co., Chicago, Ill.***3,500 tons, to Bethlehem Steel Corp., Bethlehem, Pa.***500 tons, to Colorado Fuel & Iron Co., Pueblo, Colo.

†PILING—**South Boston, Mass.**—U. S. Eng., Custom House, Boston, replacing wood piling with steel sheet piling, incl. 7,000 tons steel, furnishing 350,000 cu.yd. fill, separate contracts. $896,000 funds allotted by P.W.A.

GRADERS—**Jackson, Miss.**—E. D. Kenna, dir. State Hy. Comn., 4 graders, to Mississippi Road Supply Co., Jackson; 4 graders, to Willett Mfg. Co., Grand Rapids; 4 graders, to Root Spring Scraper Co., Kalamazoo, Mich. Est. $7,000. Bids Dec. 4.

STRUCTURAL ANGLES — **Jackson, Miss.** — E. D. Kenna, dir. State Hy. Comn., Standard Life Bldg., furnishing 6,670 structural angles, to Jones & McLaughlin Steel Co., Industrial Court, New Orleans, La.***bolts and nuts, to Pigeon-Thomas Iron Co. and Western Screw Mfg. Co., 3217 West 47th Pl., Chicago, Ill.*** cut washers, to Planters Hardware Co., Yazoo City. Est. $4,500. Noted Dec. 6.

WASHED GRAVEL, etc.—**Jackson, Miss.**—E. D. Kenna, dir. State Hy. Comn., Standard Life Bldg., Jackson, 2,531 tons washed gravel (stabilizer aggregate) for use in the construction of gravel base course for U.S.P. Wks. Project NRH 5, Parts 1 and 2 and NRM 5, on the Jackson Meridian Hy., Rankin Co., to Forrest Co. Gravel Co. and American Sand and Gravel Co., Hattiesburg, $1,563. Bids Dec. 11, awarded Dec. 12.

RAILS—**Kansas City, Mo.**—Atchison, Topeka & Santa Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., 22,867 tons, rails, to Colorado Fuel & Iron Co., Pueblo, Colo.***1,437 tons, to Illinois Steel Co., 208 South LaSalle St., Chicago, Ill.***917 tons Bethlehem Steel Co., Bethlehem, Pa.*** 660 tons, to Inland Steel Co., 101 West 31st St., New York.

†CABLE TERMINAL STRUCTURES—**Montana**—U. S. Eng., 707 Telegraph Bldg., Kansas City, Mo., 6 portable cable terminal structures at Fort Peck Dam, to Pacific Electric Mfg. Co., 5815 3rd St., San Francisco, Calif., $4,680. Est. $5,000. Bids Dec. 12, awarded Dec. 18.

†LAND PIPE—**Montana**—U. S. Eng., Kansas City, Mo., furnishing 28 in. land pipe and connecting links to be used in connection with dredges at Fort Peck Dam, to McClintic-Marshall Corp., Bethlehem, Pa., $31,530. Est. $40,000. Bids Dec. 12, awarded Dec. 18. Noted Dec. 18.

†LUMBER—**Omaha, Neb.**—U. S. Eng., City Natl. Bank Bldg., Omaha, hubs and stakes delivered to U. S. Eng. Office, Florence, to Bradford Kennedy Lumber Co., 351 South 25th St., Omaha; stakes delivered to U. S. Material Yard, to E. S. Gaynor Co., 1819 East 3rd St., Sioux City, Ia. Bids Dec. 13.

CEDAR POLES—**Fallon, Nev.**—Churchill Co., 1 carload butt treated Class C, cedar poles, to I. H. Kent Co., Fallon, $827. Bids Dec. 11, awarded Dec. 14. Noted Dec. 6.

TANKS—**Rochester, N. Y.**—Hup Oil Co., Rochester, 150 tons steel storage tanks (150 tons steel) to Buffalo Tank Corp., Lackawanna.

CRUSHED STONE, etc.—**Providence, R. I.**—City, Bd. Contr. & Supply, City Clerk, City Hall, crushed stone to Street Dpt. for 1 year, to T. J. Quinn & Son, Inc., 95 Fountain St.; Colprovia, to Street Dpt. for 1 year, to M. A. Gammino Constr. Co., 728 Valley St.

GATE VALVES—**Providence, R. I.**—City, at office of City Clerk, City Hall, F. S. Nolan, comr. P. Wks., gate valves, to Reading-Pratt & Cady Co., Inc., 566 Capital Ave., Hartford, Conn., $9,010. Bids Nov. 26, awarded Dec. 13. Noted Nov. 15.

CABLE—**Kimberly, Wis.**—Village, furnishing cable, etc. for fire alarm system, to Graybar Electric Co., 778 North Milwaukee, $1,077. Bids Dec. 3.

PIPE—**Neenah, Wis.**—City, vitr. clay and brick sewer pipe, to Home Fuel Co., Neenah, $1,748.

FOREIGN

Australia — Jan. 22, by Director Posts & Telegraph Dpt., **Melbourne,** supply telephone head sets, telegraph induction coils and regula-

Constr. News page 258

tors***Jan. 14, by City Engineer, **Sidney,** supplying supervisory equipment for remote control from a central office of switchgear and transformers to be used in 33,000 volt sub-station; Jan. 28, by New South Wales Dpt. Railway Transport, traffic control equipment for 19 street crossings.

Australia, Canberra—Federal Government preparing plans converting Australian trunk railways from their broad gage to standard of 4 ft. 8½ in. $105,000,000. State Parliaments and Railway Commissions approval expected this month.

England—D. Cooper, Clarence St., bids about Jan. 15, for constructing 1,000 houses, **Warrington,** $1,100,000***Lord & Mellowdew, Ltd., Longbridge Rd., Barking, preparing plans erecting 568 houses, **Ilford,** $625,000***County Public Assistance Com., **Durham,** bids early in 1935 for hospital at Dryburn, $700,000***Mitchell Bearings Co. Ltd., South Benwell, preparing plans plant, **Newcastle,** $575,000***Marconi Wireless Telegraph Co., plans additions and improvements to extent of $700,000, **Chelmsford***Modern Machine Tools Ltd. preparing plans plant addition on Holyhead Rd., **Coventry,** $400,000***W. M. Sharpe, Ltd., preparing plans printing works on Thorne Lane, **Bradford,** $410,000***Netrablack Electric Co. Ltd., Erskine Rd., plans constructing plant in spring, **Acton,** $500,000***Barnford Spring Extension Ltd., Carlisle Rd., bids in January for new plant, **Wembly***Workwear Ltd. plans by Stewart McLaughlin, Royal Liver Bldg., plant, **Liverpool,** $600,000*** Coventry Gauge & Tool Ltd. plans new plant, Coventry, $400,000***British Hanovia Quartz Ltd., preparing plans factory, **Slough,** $600,000 ***Dunn Co. Ltd., manufacturing confectioners, plans by W. Milburn, 17 Faucer St., Sunderland, factory, **Sunderland,** $435,000***R. H. Simmond, New Road, takes bids in January for constructing 1,000 houses at Braunstone Estate, **Hinckley,** $1,600,000***Swannell & Bly, archts., Bridge St., Pinner, preparing plans housing, **Coventry,** $1,000,000***Royal Empire Society plans by H. Baker, Romney House, London, office building, **London,** $1,250,000*** Town Council plans by A. K. Fisher, 4a Lower Belgrave St., London, plans town hall, **Gosport,** $700,000***Liverpool** City Architect bids early in 1935, for municipal exhibition hall, $1,500,000***Middlesbrough** City Council voted $590,000 for Nunthorpe Sanitarium addition*** **Cambridge,** I. M. Easton, Stanley Hall, Easton, preparing plans rebuilding Caius College, $500,000.

Greece — Pireaus-Athens-Pelaponnesus Railroad, Athens, plans track and road bed improvements. To exceed $500,000.

Irish Free State—Bd. Health **South Tipperary** takes bids end of January for erection of 1,011 cottages, $1,616,500***Athlone** Urban Council voted $895,850 for constructing 601 houses.

New Zealand—Jan. 23, by Deputy Director, Posts & Telegraph Dpt., **Wellington,** supplying telegraph equipment, incl. bells, switchboard, plugs, camp caps, pulleys and connection strips; Jan. 24, supplying differentially wound-telephone headgear receivers; Jan. 21, 100 microtelephone sets and cases and 100 transformers; Jan. 29, telephone instrument and switchboard cords*** Mar. 5, by Public Wks. Supplies & Tenders Com., **Wellington,** 8,000 k.v.a. oil immersed single phase transformers; Feb. 19, 50,000 volt outdoor switchgear with necessary structural steel work for addition to Henderson Substation***Apr. 5, by Chairman, Drainage Bd., **Christchurch,** supplying 5 panels for use on 3 phase, 400 volt, 50 period supply at pumping station; also 3 electric driven sewerage pumping sets, each consisting of horizontal centrifugal pump, direct coupled to electric motor***Feb. 13, by Deputy Director, Posts & Telephone Dpt., **Wellington,** 18 power relays designed to operate from 24/3 volt D.C. circuit to close 1 pair of contacts, capable of breaking 1 amp. at 250 volt inductive circuit.

Scotland—Mental Hospital Joint Committee, **Lanark,** voted $1,210,000 for additional buildings; Grampian Electric Supply Co. Bd., Melville St., **Edinburgh,** awarded contract plant, to Balfour, Beatty & Co. Ltd., 66 Queen St., London, $1,250,000, C. S. Milk, 16 Victoria St., London, engr.***Greenock** Town Council erecting 1,000 houses, to J. MacDougall, Ltd., Glasgow, $1,275,000***Fairstych Ltd., c/o Walker & Fraser, 74 Bath St., preparing plans factory, Shannon St., **Glasgow,** $500,000*** **Hamilton** Town Council plans by Gavin Paterson & Son, Hamilton, 224 houseas, $430,000.

Siam, Bangkok—Jan. 25, by Royal Siamese Railways, supplying 10,000 kg. flat spring steel. Tenders should be sent by air mail.

South Africa, Johannesburg—T. H. Watermeyer, mgr. South African Railways & Harbors Administration, in market for supply 1 5 M electrical driven overhead traveling crane, wrought iron short link chains for year 1935 to June 1936 and for 170 tons steel work for bridges; Jan. 29, by Electrical Supply Comn. for supply of 3 water tube boiler units with mechanical draught plant, chimney and fuel handling and oil elimination plant for 2 turbo-alternators, also 3 feed pumps to be driven by steam or electricity and for feed heater and surge tanks.

Turkey — Textile Concession, c/o Turkish Government, Ankara, plans woolen mills in Central Anatolia Region, in Broussa. Site selected. $1,500,000.

Union Socialist Soviet Republics—Commissariat of Heavy Industry, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, metallurgical plant for pig iron, steel and rolled metal in Khingan Bureisk Dist., by day labor. To exceed $5,000,000.

Union Socialist Soviet Republics—Oil Trust Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans developing oil properties in Kos-Chagyl fields in Khaudag Region. $500,000.

Union Socialist Soviet Republics — Special Comn., c/o Soviet Government, Moscow, or c/o Amtorg Corp., 261 5th Ave., New York, making tests and surveys for gold mining (dredging of placer mining) near Armavir along upper Urup and Kuban Rivers, also plans developing gold mining properties in Bashkira, North Caucausus. To exceed $500,000.

PUBLIC BUILDINGS

PROPOSED WORK

Ariz., Tucson—University of Arizona, Tucson, plans by R. Place, 11 East Pennington St., administration building $40,000; infirmary $30,000; reserve officers' training corps stables $17,500; museum $65,000. P.W.A. project.

Calif., Long Beach—Long Beach Bd. Educ., approved plans by E. R. Bobbe, Hartwell Bldg., Thomas A. Edison Elementary School, $125,000. V. W. Bullock, 4719 Livingston Dr., Long Beach, engr.

Calif., Los Angeles—Los Angeles Bd. Educ., applied for building permit to construct 2 story and 1 story, Class D brick shop buildings consisting of rebuilding brick walls, adding new brick facing, anchors, bracing, altering partitions, etc., at John Burroughs Jr. High School, 600 South McCadden Pl., $120,500. A. R. Hutchason, 1001 Architects Bldg., archt. R. Mc. Beanfield, 615 Chamber of Commerce Bldg., engr.

Calif., Los Angeles—Bd. Educ., plans by E. Bergstrom, Citizens Natl. Bank Bldg., and has authorized architect to proceed with 18 unit new building at South Park School, 455 East Manchester Ave. $110,446. Preliminary working drawings approved.

Calif., Oakland—Oakland City School Dist., granted $1,183,000 P.W.A. allotment to finance erection of new schools and improvements to standing structures. No bond issue for repayment is available and payments must be made from annual school department revenues.

Calif., San Francisco—S. J. Hester, secy., Dpt. P. Wks., rejected bids Dec. 5, rein.-con. school Visitacion Valley, incl. 17 classrooms, library, auditorium, kindergarten, for City and San Francisco Co. $246,500. Will readvertise.

Calif., San Francisco—City and San Francisco Co., plans completed by L. P. Hobart, Crocker Bldg., and Bliss & Fairweather, Balboa Bldg., 2 story, rein.-con. school, 475 seating capacity auditorium, Brompton St. $300,000. Awaiting P.W.A. approval. J. B. Leonard, 677 10th Ave., structural engr. R. L. St. John, 544 Market St., mechanical engr.

†Conn., Thompsonville—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans constructing U. S. Post Office, High and Garvey Sts. $70,000. Site selected. Noted Sept. 6.

†Ga., Augusta—Treas. Dpt. at office Sup. Archt., Wash., D. C., completing plans altering and constructing post office addition. $190,000.

Ind., Muncie—Bd. Comrs., Delaware Co., plans completed by H. E. Smenner, Muncie, and soon takes bids brick, steel addition for county hospital, East Jackson St. $107,000.

Ind., Wabash—City plans electric light plant on site south of Wabash River. Management & Eng. Co., 327 South LaSalle St., Chicago, Ill., engrs.

Ia., Bettendorf—City Council, G. Sehmann, mayor, plans municipal light and power plant.

Ky., Louisville—Bd. Educ., 8th and Chestnut Sts., plans remodeling Bd. Educ. offices, 8th and Chesnut Sts., transforming them into Negro High School, est. about $71,000; remodeling structures at 5th and Hill Sts. to be used as an office for Bd. Educ., est. about $45,000. J. Myrick Cooley, c/o Bd. Educ., archt.

†Massachusetts — State Housing Bd., S. T. Strickland, chn., 1127 Statler Bldg., Boston, plans housing projects for 800 families, Main St., East Cambridge, $2,500,000; 1,000 families, A to E Sts. and Bway to Southern Artery, South Boston, $3,000,000; 1,000 families at Jefferies Point, East Boston, $3,000,000; and 1,000 families at Medford St., Charleston, $3,000,000.

Mass., Chicopee—City, J. J. Desmond, supt. Schools, purchased site for elementary school, Newbury St. $105,000. Architect not appointed. No action on plans. Purchased site for elementary school Beauchamp Terrace in Chicopee Falls. $105,000. Project in abeyance.

Mass., Chicopee—J. J. Desmond, Jr., supt. Schools, postponed construction Junior High School, 2 story, basement, 60x160 ft., brick, steel, Fairview Ave. $250,000. P.W.A. project 6470. Money allotted. H. J. Tessier, 220 Dwight St., Springfield, archt. Noted Aug. 2.

†Federal Government.

Public Buildings (Continued)

Mass., Fitchburg — City, R. E. Greenwood, mayor, City Hall, School Committee and Planning Bd. will confer with various architects immediately with view to rebuilding high school, recently destroyed by fire. $750,000 damage. Architect not appointed.

Mass., Newburyport — City, G. W. Morrill, mayor, City Hall, plans by E. S. Dodge, 148 State St., Boston, 3 story, basement, brick, stone high school, concrete found. $450,000. P.W.A. project.

Mass., Swampscott—Town, H. S. Baldwin, chn. Building Com., 141 Elmwood Rd., plans by Cram & Ferguson, 248 Boylston St., Boston, brick, stone and granite high school, concrete found., Phillips Park. $350,000. P.W.A. project. To be voted on at February town meeting.

†**Mass., Watertown** — Commanding Officer, Watertown Arsenal, plans remodeling buildings and structures, on Arsenal St. $48,000 allotted by P.W.A.

Mich., Mt. Pleasant—Bd. Educ., plans by Merritt & Cole, 1111 Collingwood Ave., Detroit, 2 story, basement, 63x117 ft., rein.-con., steel school, plain found., High St. $105,000. P.W.A.

Mo., Independence—City withdrew bids to have been opened Dec. 20, constructing brick, concrete power plant. Black & Veatch, 700 Mutual Bldg., Kansas City, engrs. New date not decided.

Mo., Kansas City—Bd. Educ., County Bldg., rejected bids Nov. 22, heating, ventilating, temperature regulation, plumbing and drainage for Lincoln High School. $115,000. Will readvertise in about 30 days. P.W.A. project. Other bids received Nov. 22 held for further consideration. Noted Dec. 13.

†**Mont., Browning** — Bureau Indian Affairs, Dpt. Interior, Wash., D. C., rejected bids 1 story, 126x178 ft., hospital building, nurses' quarters, at doctor's quarters for Blackfeet Indian Reservation. $172,500. Noted Oct. 25.

N. J., Dunellen—Bd. Educ. bids after Feb. 1, school. $300,000. Karff Paggi & Bragdon, 203 Park Ave., Plainfield, archts. Noted Nov. 23, 1933.

N. J., Teaneck—Bd. Educ., High School, soon takes bids 3 story high school addition. $635,000. P.W.A. loan granted. Hacker & Hacker, 201 Main St., Fort Lee, archts. O. E. Goldsmith, 110 West 40th St., New York, consult. engr. Noted Oct. 19, 1933.

N. J., Trenton—Dpt. Institutions & Agencies, State Office Bldg., plans constructing wards, fireproofing State Hospital, $407,500 allotted by P.W.A.; and 2 buildings at Woodbine Feeble Minded Colony, $82,500 allotted by P.W.A. Engineer not appointed.

†**N. Y., Mamaroneck**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids post office, Mount Pleasant and Palmer Aves. $72,000. Site selected. O. R. Eggers, 15 South Drive, Larchmont, archt. Noted Mar. 9, 1933.

†**N. Y., Mount Kisco**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids post office, 132 Main St., $58,000. Site selected. M. B. Schmidt, 14 East 46th St., New York, archt. Noted Feb. 9, 1933.

N. Y., New York—City, Bureau of Buildings, Municipal Bldg., sketches by Cass Gilbert Associates, 244 Madison Ave., 37 story criminal courts building, site of Tombs Jail. To exceed $5,000,000. **Maturity indefinite.**

N. Y., New York—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, plans municipal electric power plant. To exceed $15,000,000. Owner will apply to P.W.A. for loan to finance same.

N. Y., Poland—Central School Bd. plans 2 story, basement, central grade and high school. $150,000. Architect not appointed.

N. Y., Roxbury—Central High School Dist. plans completed by A. O. Fullerton, 111 State St., Albany, for Central School, 2 story, basement, brick, steel, plain found. $159,000. Awaiting P.W.A. loan.

N. Y., Schroon Lake—Central School Bd., plans by C. W. Clark, State Theatre Bldg., central grade and high school. $289,800. P.W.A. project. Former award cancelled. Noted Nov. 1.

N. Y., Syracuse—Dpt. Military & Naval Affairs, Capitol, Albany, plans by W. E. Haugaard, State Office Bldg., Albany, constructing artillery armory, East Genesee St. $300,000. T. F. Farrell, State Office Bldg., Albany, engr.

†**N. C., Cherokee**—Bureau Indian Affairs plans by Schmidt, Garden & Erickson, 104 South Madison Ave., Chicago, Ill., 1 story, basement, brick, steel hospital, Swain Co., $80,000. Preliminary estimates being made. Noted July 12.

O., Sandusky—City Comn. has been advised that if certain revisions are made in plans and specifications of municipal light plant, application for loan might be favorably regarded as to loan and grant. Revision is now proceeding. $1,400,000. Froelich & Emery, 2nd Natl. Bank Bldg., Toledo, engrs. Noted Mar. 8.

Wash., Seattle—Bd. Regents, University of Washington, plans by J. Graham, Dexter Horton Bldg., and D. Myers, Central Bldg., and later bids latter part of January, women's dormitory, $500,000.

Oregon — Mountain States Power Co., Albany, plans extending and altering power plants and distribution system in 1935. $400,000.

South Carolina—See "Unclassified."

†*Federal Government.*

Tex., Port Arthur—Jefferson Co., c/o B. B. Johnson, judge, Beaumont, new bids after Jan. 1, 3 story, fireproof sub-office and jail building. $173,000. Former bids rejected. F. C. Stone, Goodhue Bldg., Beaumont, and C. L. Wingall, 915 4th St., archts. Noted Dec. 27.

Ont., Schrieber—Ratepayers, election Jan. 7, on by-law to provide $25,000 for proposed town lighting system (electric). It is proposed to purchase 2 Diesel engines, generators and general equipment. W. A. Spicer, town clk.

Ont., Toronto—Bd. Educ. purchased site at Glengrove and Glenview Aves., and takes bids in January for construction thereon of collegiate building. $367,000.

BIDS ASKED

†**Ala., Tuskegee**—Jan. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†**Ark., Osceola**—Jan. 2, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

Calif., San Francisco—Jan. 23, by S. J. Hester, secy. Dpt. P. Wks., City Hall, general contract 2 story, rein.-con., school, auditorium, $216,000, mechanical equipment $31,000, electrical work $14,000, painting $31,000, on Brompton St., for City and San Francisco Co. Noted Dec. 20.

†**Ga., Decatur**—Jan. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†**Ind., Union City**—Jan. 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 21, 1933.

†**Ky., Hazard**—Jan. 16, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Feb. 16, 1933.

†**La., DeRidder**—Jan. 11, by Treas. Dpt. Procurement Div., Pub. Wks. Branch, Wash., D. C., constructing U. S. Post Office. Noted Sept. 13.

†**Md., Baltimore**—Jan. 7, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing inclosures for porches at U. S. Medical Officer in charge quarters, at Quarantine Station.

†**Mass., Cambridge**—Jan. 11, by Treas. Dpt. at office Sup. Archt., Wash., D. C., interior lighting fixtures in U. S. Post Office.

Mass., Somerville—Dec. 31, by City, W. J. Sullivan, comr. P. Bldgs., City Hall, 2 story, basement, 159x215 ft., brick, stone vocational and elementary school, concrete found., Cross, Bonair and Otis Sts. $425,000. P.W.A. project. J. P. Heffernan, 131 State St., Boston, archts. Noted Aug. 16.

Mo., Liberty—Jan. 3, by Clay Co., 3 story, basement, brick, steel court house. $275,000. Wight & Wight, 400 1st Natl. Bank Bldg., Kansas City, archts. Noted Nov. 22.

†**N. J., Ridgefield**—Jan. 10, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 6.

N. Y., Albion—Jan. 17 (extended date), by Commissioner Dpt. Correction, State Office Bldg., Albany, construction, heating, sanitary and electrical work at Albion State Training School. Noted Nov. 29.

N. Y., Auburn—Jan. 24, by Commissioner Dpt. Correction, State Office Bldg., Albany, heating work, heating service lines and connections, Auburn Prison.

N. Y., Auburn—Jan. 31, by Commissioner Dpt. Correction, State Office Bldg., Albany, construction work, heating, sanitary, and electrical work for cold storage building, Balkies and service connections, also construction work for marquise on guard towers, Auburn State Prison.

N. Y., Beacon — Jan. 10, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, construction, sanitary and electrical work for farm buildings at Matteawan State Hospital.

N. Y., Bedford Hills—Jan. 31, by Commissioner Dpt. Correction, State Office Bldg., Albany, construction and electrical work for remodeling present staff house into inmate accommodations, at Westfield State School.

N. Y., Binghamton—Jan. 18, by Adjutant General, Div. Military & Naval Affairs, Capitol, Albany, construction, heating, electric work for storage building, and miscellaneous additional work, State Armory.

N. Y., Creedmoor — Jan. 30, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, miscellaneous addition construction work at Brooklyn State Hospital.

N. Y., Delhi — Jan. 24, by Commissioner Dpt. Education, Education Bldg., construction, heating, sanitary and electrical fixtures for Home Economics Building, Farm Mechanics and Shop Building and service tunnel, at New York State School Agriculture, and Domestic Science.

N. Y., Kings Park — Jan. 9, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, completing sanitary work, continued treatment building, employees and staff accommodations at Kings Park State Hospital.

†**N. Y., New York**—Treas. Dpt. at office Sup. Archt., Wash., D. C., taking bids constructing College Postal Station, 2 story, basement, brick, limestone, 217-221 West 140th St. $88,000. W. D. Foster, 25 West 45th St., archts. Noted Nov. 29.

†**N. Y., New York**—Jan. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Postal Station M.

†**N. Y., Northport**—Jan. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

N. Y., Rome—Feb. 6, by Dpt. Mental Hygiene, State Office Bldg., Albany, construction, heating, sanitary and electrical work for Female Isolation Building (Building Q) at Rome State School.

N. Y., Saratoga Springs—Jan. 3, by P. B. Noyes, chn. Saratoga Springs Comn., 15 Spring St., completing construction work drink hall for State Reservation.

N. Y., Thiells — Jan. 3, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, electrical work, remote control, switches, etc., at Assembly Hall, Building 62, addition to Stewart Hall Building No. 2A; Vanderlip Hall addition, Building 28A, at Letchworth Village.

N. Y., Thiells—Jan. 9, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, constructing ventilating work, Farm Barns, Letchworth Village.

N. Y., Woodbourne—Jan. 15, by Commissioner Dpt. Correction, State Office Bldg., Albany, heating and sanitary work, kitchen equipment, mess hall buildings at Institution for Defective Delinquents.

†**N. C., Tolars Landing**—Jan. 4, by U. S. Eng., Wilmington, erecting 2 lock tenders houses and garage here, 20 mi. below Fayetteville, where War Dpt. is completing 3rd Lock in river.

†**O., Bellevue**—Jan. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 13.

†**S. D., Huron**—Jan. 22, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling, extending U. S. Post Office.

†**Vt., Newport**—Jan. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., installing new elevator, hoistway, etc., at U. S. Post Office and Court House.

†**Wash., Prosser**—Jan. 16, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 27.

CONTRACTS AWARDED

Calif., Altadena—Pasadena Bd. Educ., 2 story elementary school, to O. H. Strauser, 900 Dawson Ave., Long Beach, $120,784. **P.W.A.** Noted Nov. 15.

Calif., Folsom—State Purchasing Dpt., Sacramento, furnishing jail equipment at Folsom State Prison, to Palm Iron Wks., 15th and S Sts., Sacramento, $31,399. Awarded Dec. 13.

Calif., Long Beach—Bd. Educ., constructing academic building at Franklin Junior High School, to J. K. Thomas, 700 Kress Bldg., $163,700. **P.W.A.** G. D. Riddle, 2826 Cedar Ave., archt.

Calif., Los Angeles—Bd. Educ., reconstructing, rehabilitating, strengthening annex building at Angeles Mesa School, 52nd St. between 4th and 5th Sts., to Contracting Engineers, Inc., 2310½ West Vernon Ave., $20,994*** reconstructing, rehabilitating, strengthening Buildings "A" and "C" and erecting new Building "B" at Gage Ave. School, Miles and Gage Aves., Huntington Park, to Reid & Alexander, 5714 Pacific Blvd., Huntington Park, $83,960. **P.W.A.** Awarded Dec. 6 and 10 respectively.

†**Calif., Palo Alto**—Vet. Administration Facility, Arlington Bldg., Wash., D. C., revising Building 105, incl. wrought iron and wire grilles, remodeling interior for use as mental ward, to C. M. Norgrove, 2220 Roosevelt St., Berkeley, $21,975. Awarded Dec. 12.

†**Calif., Redwood**—Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract U. S. Post Office, to K. E. Parker Co., 135 South Park St., San Francisco, $39,590. Bids Dec. 10. Noted Nov. 15.

†**Idaho, Burley**—Treas Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. C. Jordan & Son, Boise, Idaho, $56,748. Bids Dec. 4. Noted Nov. 15.

†**Ill., Urbana** — Treas. Dpt. at office Sup. Archt., Wash., D. C., demolishing and extending, remodeling U. S. Post Office, to J. DeVault, Canton, O., $57,750.

†**Ind., Indianapolis** — Federal Emergency P. Wks., Wash., D. C., demolishing buildings on site of community housing project, for negroes, to Cleveland Wrecking Co., 1415 Harrison St., Cincinnati, O. Est. $1,000,000. Noted Nov. 22.

Md., Baltimore—Maryland General Hospital, Linden Ave. and Madison St., roof garden on top of present power house, to Thos. Hicks & Sons, 106 West Madison St. Est. $25,000. Ready for sub-bids in a few days. W. W. Emmart, Union Trust Bldg., archts.

Mass., Dorchester—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing electric lighting fixtures and lamps for male employees building at Boston State Hospital, to Creed-Hirons Co., 285 Columbus Ave., Boston. Est. exceeds $1,000. **P.W.A.** Bids Nov. 14, awarded Dec. 14.

Mass., Tewksbury—J. M. Concannon, general contractor, 157 Warren Ave., Milton, electrical work for 2 story, basement, 64x138 ft. high school, to Carrol Electric Co., 170 Summer St., Boston; steel, to R. and S. Bethlehem Steel Fabricators, Inc., Bethlehem, Pa.***iron, to Hub Steel & Iron Wks., Inc., 43 Freemont St., Somerville***cast stone, to Artificial Stone Co., Turners Falls, for Town, M. G. Rogers, chn. Building Comn. Noted Nov. 15, under "Contracts Awarded."

Mich., Manistee—Mrs. L. Brugman, secy. Bd. Educ., general contract steel, rein.-con., brick school, plain found., to Anderson Constr.

Constr. News page 259

Public Buildings (Continued)

Co., $50,378***heating, to Lloyd & Smith, Manistee, $11,549***electrical work, to Hall Electric Co., Muskegon, $16,880. Grand total $78,807. **P.W.A.** Noted Nov. 22.

†Mo., Kansas City—Treas. Dpt. at office Sup. Archt., Wash., D. C., miscellaneous changes in U. S. Post Office, to Universal Constr. Co., Kansas City, $22,950.

Mont., Columbia Falls—Flathead Co. School Dist. 6, C. O. Bolick, clk., plumbing and heating for 2 story, 34x146 ft. dormitory, to Service Plumbing & Heating Co., Kalispell, $8,155. **P.W.A.** Noted Dec. 20, under "Contracts Awarded."

N. J., Jersey City—Hudson Co., general contract tuberculosis hospital, to J. Mitchell, 576 West Side Ave., $1,512,480***structural steel, to Lehigh Structural Steel Co., Allentown, Pa., $375,000***electrical work, to J. Neuman, Inc., Jersey City, $179,900. Grand total $2,067,380. **P.W.A.** Bids Nov. 8.

†N. J., Newark — Treas. Dpt. at office Sup. Archt., Wash., D. C., exterior and interior lighting fixtures, to Simmes Co., 22 West 15th St., New York, N. Y., $22,747. Bids Nov. 9. Noted Nov. 1.

N. Y., Newark—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, heating work for power plant, to Freyn Bros. of Michigan, Inc., 1708 West Lafayette Blvd., Detroit, Mich., $35,835. **P.W.A.** Bids Oct. 17. Noted Sept. 27.

N. Y., Interlaken—Swartout & Rowley Co., general contractors, Mount Hope Ave., structural steel for Central School, to Smith & Caffery Co., 2011 Lodi St., Syracuse, for Central School Bd. Noted Dec. 13, under "Contracts Awarded."

Pa., Pittsburgh—Allegheny General Hospital, H. L. Mason, chn. Bd., allotted P.W.A. loan and grant $2,000,000 to complete work on the hospital, incl. heating, plumbing and electrical work. Work to start within 30 days. J. L. Stuart, Oliver Bldg., Pittsburgh, general contractor; Lord Electric Co., 105 West 40th St., New York, and Wabash Bldg., Pittsburgh, electric work; Baker-Smith & Co., 576 Greenwich St., New York, heating and ventilation; Geo. H. Saffel Co., 107 East Carson St., plumbing.

†Pa., Swarthmore—Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract U. S. Post Office, to Hadley Constr. Co., 802 Fox Bldg., Phila., $31,898. Bids Nov. 7. Noted Oct. 18.

Tex., Morton—See "Waterworks."

†Tex., Shamrock—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Finch Co., Farmsville, $36,105. Bids Dec. 7. Noted Nov. 22.

Wis., Green Bay—Brown Co., refrigeration work at county asylum, to Bay Appliance Co., Green Bay, $923***overhead water storage tanks, to Chicago Bridge & Iron Wks., 33 West Van Buren St., Chicago, Ill., $6,085*** grading to J. C. Baster, Green Bay, at 21c. per cu.yd. New bids to be taken on sewage disposal plant. Noted June 14, under "Contracts Awarded."

N. S., Halifax—Secretary Dpt. P. Wks., Ottawa, Ont., public library, to Stewart Constr. Co., Ltd., Sherbrooke, Que., slightly in excess of $500,000. Bids Nov. 27, awarded Dec. 10. Noted Nov. 15.

COMMERCIAL BUILDINGS

PROPOSED WORK

Ariz., Phoenix—Goodrich Building & Realty Co., soon takes bids air conditioning office building, Central Ave. and Washington St. $28,000 or more. R. M. Quackenbush, Phoenix, engr.

La., Edgard—St. John the Baptist Parish, courthouse and jail. P.W.A. loan of $150,000 rescinded. Election for issuance of bonds failed to approve issue.

N. J., Englewood—Robert Livingston, Jr., plans repairing heating and plumbing in store and apartment, Dean St. and Palisade Ave. To exceed $50,000. Architect not appointed.

N. Y., New York—V. Green, 45 West 34th St., plans loft and manufacturing building, Hudson St. from West Houston and Clarkson Sts. To exceed $500,000. Architect not appointed.

N. Y., Rochester—Rochester Union Trust Bldg., 19 West Main St., plans 3 story, 80x90 ft., brick, steel office, South Ave. Private plans.

N. Y., Utica—Broadacres Sanitarium, 653 East Parkway, plans completed by Bogg & Newkirk, 258 Genesee St., and soon takes bids brick, steel children's pavilion and employees accommodations, plain found., $250,000. P.W.A. project. E. Kurtz, 258 Green St., engr.

R. I., Glocester (mail Putnam, Conn.) — Town, Public School Dpt., C. W. Mitchell, supt., plumbing for 6 room elementary School, Chopachet Dist. and 4 room elementary school, Harmony Dist., to J. P. Cuddigan, 938 Bway., East Providence; slate work, to Capitol Marble & Tile Co., Inc., 48 Oxford St., Providence. Noted Sept. 27, under "Contracts Awarded."

Va., Lexington—Washington and Lee University, plans replacing Tucker Hall with law and law library building, $100,000 or more. **Maturity indefinite.**

BIDS ASKED

O., Cincinnati—See "Contracts Awarded."

CONTRACTS AWARDED

O., Cincinnati—Silver Hup Cafe, 612 Vine St., air conditioning and heating in restaurant, 522 Vine St., to American Store Equipment Corp., 522 Vine St. Est. $50,000.

O., Cincinnati—Todd Bros. Apparel Co., 5580 Overlook Ave., air conditioning and elevator work in department store, 31 West 4th St., separate contracts. Est. about $40,000. G. Droch, Union Trust Bldg., archt. Fosdick & Helmer, Union Trust Bldg., mechanical engr.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., San Fernando—PACKING PLANT—San Fernando Heights Orange Assn., plans by W. W. Ache, 1616 4th Ave., Los Angeles, 1 story, basement, 114x122 ft., rein.-con., near San Fernando Mission. $40,000.

Fla., Bagdad—LUMBER and SAW MILL—Bagdad Lumber Co., Bagdad, plans replacing burned lumber and saw mill. To exceed $30,000. $150,000 fire loss.

Fla., Hialeah — BREWERY — C. E. Barr, Hialeah, plans reconditioning brewery. $60,000.

Idaho, Wallace — GOLDSTONE MINING — Callahan-Zinc Lead Co., plans developing goldstone mining properties. To exceed $150,000.

Mich., Saginaw—FACTORY—Michigan Institution for the Blind, plans by Chas. H. Noble, Ann Arbor, 1 story, 96x265 ft. rein.-con., brick, steel, plain found. $50,000.

Mo., St. Louis—SERVICE STATIONS—Texas Corp., 135 East 42nd St., plans group service, repair and shop buildings, Garrison and Cass Aves., here and vicinity. To exceed $30,000.

N. Y., Elmsford—FACTORY—E. J. Bromound Co., Elmsford, plans brick, concrete, Tarrytown Rd. $28,000 or more.

Md., Baltimore—WAREHOUSE—C. H. Osborne, archt. and engr., 222 West Franklin St., soon lets contract for Warehouse 3, 6 story, 90x150 ft., Dundalk, Sellers Point Rd., for Baltimore Pure Rye Distillery Co., Dundalk St. $100,000.

Mich., River Rouge—MILL—Ford Motor Co., Schaeffer Rd., Dearborn, will award contract about Mar. 1, 1935, for plant equipment for expansion program to include equipment for steel rolling mills and miscellaneous machinery. $8,000,000.

N. J., Newark—MARKET—A. P. K. Realty Co., c/o N. J. Convery, archt., 32 Walnut St., Newark, will not build 1 story, basement, market, Vanderpool St. and Avenue B. $35,000. Project abandoned.

N. Y., Buffalo—SHEET MILL—Bethlehem Steel Co., Bethlehem, Pa., soon takes bids sheet mill at Lackawanna Mill. $10,000,000.

N. Y., Oswego — PLANT — Johns Manville Corp., 22 East 40th St., New York, leased Oswego Board Corp. plant and plans altering same for insulating board manufacture and distribution of company's products. To exceed $28,000 with equipment.

O., Carrollton—PLANT—Carrollton Chronical, E. V. Lawler, plans rebuilding newspaper and printing plant, recently destroyed by fire. To exceed $28,500. Architect not appointed.

O., Cleveland—FACTORY—Allied Printing & Bindery Mchy., Inc., P. V. Jones, pres., 1975 East 65th St., plans 1 story, brick, steel, concrete, Chester Ave. $40,000. Architect not appointed.

Ore., Portland — STORAGE and SHOP — Vaughan Motor Co., 475 East Main St., plans storage and shop. $28,000 with equipment. Architect not appointed.

Pa., Hawley—KNITTING MILLS—Fairplay Knitting Mills, plans repairing and altering knitting mills. To exceed $30,000. Architect not appointed.

R. I., Providence—WAREHOUSE—General Tire & Rubber Co., 78 Broadway, plans by H. Marshak, 36 Exchange Pl., 2 story, basement, brick, concrete, concrete found., Bway.

Tenn., Memphis—GARAGE—M. C. Smith, 333 Monroe Ave., plans garage and storage. To exceed $30,000. Architect not appointed. Johnson Motors Co., 333 Monroe Ave., lessee.

Va., Falling Creek—DISTILLERY—Old Dixie Distillery Co., c/o C. M. Mahaley, Falling Creek, plans distillery. To exceed $35,000.

Wash., Vancouver—MALT HOUSE—A. I. Blitz, of Blitz Weinhardt Brewing Co., 627 Upshur St., Portland, Ore., soon takes bids malting house, Port of Vancouver. $350,000. Calland Hennig Co., Milwaukee, Wis., archts.

Alta., Calgary — POWER PLANT — Calgary Power Co., Ltd. making plans and takes bids in spring, addition to plant, $150,000.

Alta., Turner Valley—PLANT—Royalite Oil Co. Ltd., Calgary, plans absorption plant. $300,000.

N. S., Liverpool — YEAST PLANT — Best Yeast Co., c/o Thesingh & Moss, engrs., 75 West St., New York, N. Y., sketches yeast plant. To exceed $30,000.

Ont., Brantford—MARKET—E. J. Campbell preparing plans constructing covered market building. $55,000.

Ont., Niagara Falls—FACTORY—Animal Trap Co. of America preparing plans factory addition. $35,000.

Ont., Oshawa — PLANT — Anglo-Canadian Drugs Ltd. plans manufacturing plant. $50,000.

Ont., Sioux Lookout—SAW MILL—Patricia Lumber Co. Ltd., W. H. Hearst, genl. mgr., plans saw mill. $35,000.

Que., Actonvale—PLANT—Lok-Tet Mills Ltd. plans plant. $49,000.

Que., Cap de la Madeleine—TEXTILE MILL—Associated Textile Co., Louisville, plans textile mill if certain tax privileges are granted. To exceed $500,000 with equipment.

Que., Lennoxville — PLANT — Quebec Maple Products Ltd. plans plant. $40,000. Site purchased.

Que., Pointe aux Trembles—REFINERY—St. Lawrence Oil Ltd. plans refinery here, and 15 gasoline stations on Island of Montreal. $750,000.

Sask., Regina—REFINERY—Consumers Refinery Co-Operative Assn., H. L. Fowler, secy., Wilcox, plans refinery.

BIDS ASKED

New Jersey—SERVICE, etc.—See "Contracts Awarded."

N. Y., Rensselaer—STORAGE, GARAGE, etc. —See "Contracts Awarded."

Wis., Beloit—PLANT—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Richmond—PLANT—Standard Oil Co. of California, re-run unit and refining equipment (part of lubricating oil plant), to M. W. Kellogg Co., 225 Bway., New York. Total est. exceeds $300,000. Noted Oct. 18, under "Contracts Awarded."

Ind., Decatur—STORAGE and ASSEMBLY—International Harvester Co., Chicago, Ill., storage and assembly, to F. McConnell, Decatur, Ind., $30,000 or more.

Ind., Lawrenceburg—DISTILLERY—J. E. Seagram Distillery Co., 600 tons steel for distillery plant, to Pollak Steel Co., 820 Peoples Bar Bldg., Cincinnati, O. Est. $47,500. Noted Aug. 30, under "Contracts Awarded."

Mass., Boston—PACKING HOUSE—Ferry St. Realty Co., c/o M. Rubinovitz, 12 Ferry St., general contract altering and constructing additions to 6 story, basement, packing house, Ferry St., to I. H. Bogart & Son, Inc., 69 Newbury St., approximately $50,000. Work started. General contractor awarded plumbing contract, to A. E. Roberts, 70 Washington St. Bids Oct. 28, awarded recently.

Mich., Kalamazoo—FACTORY—Sutherland Paper Co., Pitcher and Paterson Sts., 2 story, 110x340 ft., brick, steel paper carton factory, plain found., Pitcher St., to O. F. Miller Co., Kalamazoo. Est. $60,000.

Mich., Pleasant Ridge—BREWERY—Voigt Brewing Co., Ten Mile Rd. and G. T. R.R., Royal Oak, rein.-con. cellars as unit of brewery plant, to Stibbard Constr. Co., 3000 Grand River Ave., Detroit. Est. $40,000.

Minn., South Park (South St. Paul)—OIL BLENDING PLANT and OFFICE — Farmers Union Terminal Co., 1300 Minnesota Bldg., St. Paul, general contract 3 story, basement, brick, steel, to W. C. Graus Constr. Co., Hastings; heating and plumbing, to Healy Plumbing & Heating Co., 278 West Kellogg Blvd., St. Paul. Total est. $50,000. Ellerbe & Co., 100 Minnesota Bldg., St. Paul, archts.

Mo., St. Louis—POWER GENERATING PLANT—Laclede Power & Light Co., 1017 Olive St., general contract power generating plant addition, Mount St. and levee, to Management & Eng. Corp., 900 South Boyle St. Contractor let contract for fabricating 750 tons structural steel, to Superior Structural Steel Co., 5100 Farlin Ave.

New Jersey—SERVICE, etc.—Tidewater Oil Co., lessee, 17 Battery Pl., New York, constructing group service, repair and storage stations, at various locations, incl. Washington St., Bloomfield, for Corporation, c/o lessee, separate contracts. To exceed $30,000. Private plans.

N. Y., Rensselaer—STORAGE, GARAGE, etc. —Atlantic Refining Co., 260 South Broad St., Phila., Pa., bulk oil storage, distribution, garage, tanks, etc., separate contracts. $200,000.

O., Ivorydale—FACTORY—Proctor & Gamble, Co., Gwynne Bldg., Cincinnati, 2 story factory, to Ferro Concrete Constr. Co., 203 West 3rd St., Cincinnati. Est. $50,000. Contractor awarded all separate contracts incl. mechanical equipment.

R. I., Fiskeville—MILL—Arkwright Finishing Co., 1105 Turks Head Bldg., Providence, general contract 1 story, 65x188 ft., brick, concrete addition at Arkwright, near here, to J. F. McCusker, Lamphear St., Phoenix, (west Warwick), about $35,000. Bids Dec. 3, awarded Dec. 7. Noted Dec. 6.

Tex., Dallas—PACKING PLANT—Rosenthal Packing Co., 3424 Commerce St., packing plant, to A. K. Garwick, 4414 Worth St. Est. $70,000. Smith, Brubaker & Egan, 30 North La Salle St., Chicago, Ill., archts.

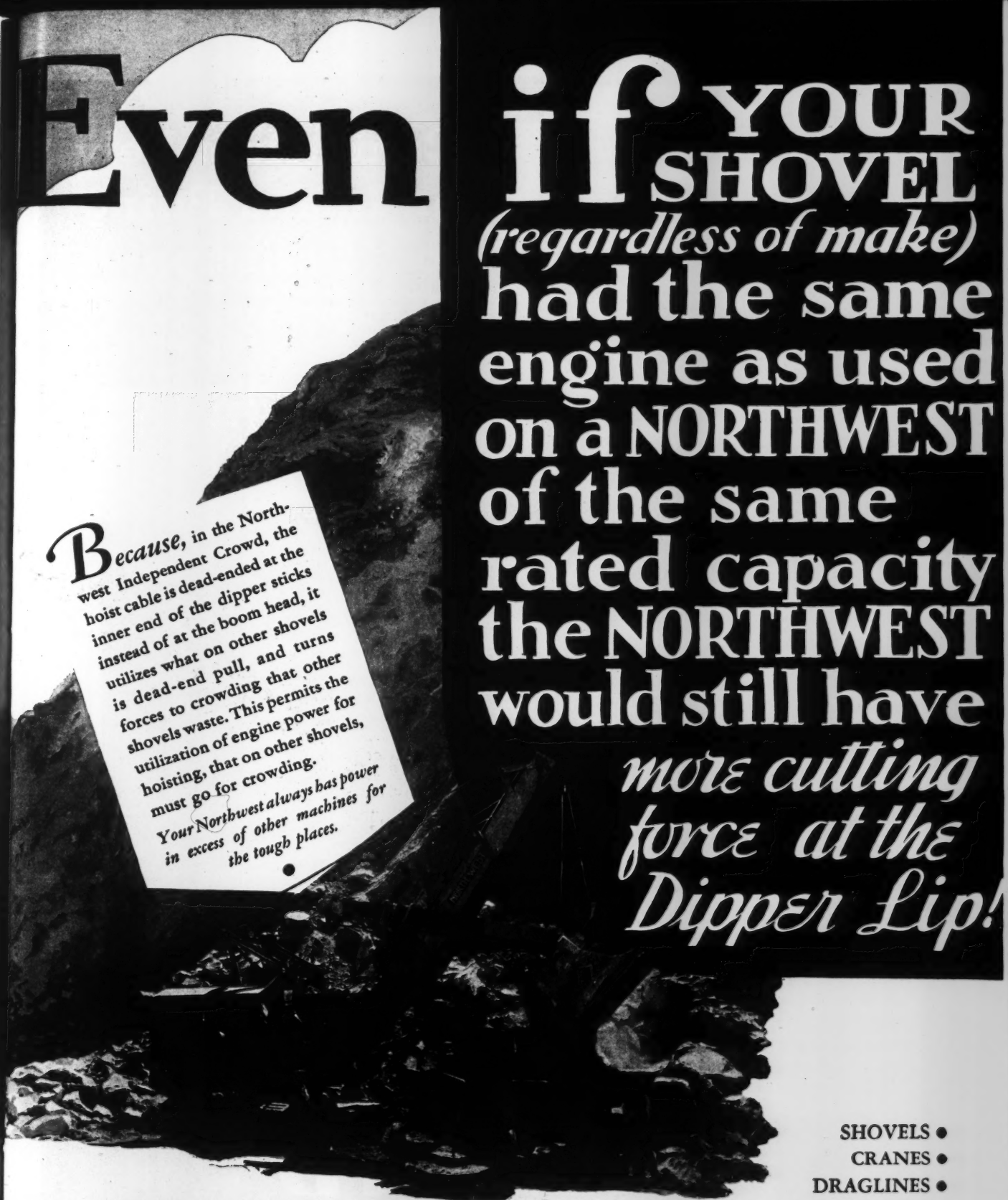
Wis., Lake Mills — MILK EVAPORATION PLANT, etc.—Dee-Hy Lake Mills, F. Hyland and E. Kuhlman, in charge, plans milk evaporating and drying plant. $60,000 or more.

Constr. News page 260

For official proposal advertising see Searchlight Section

†Federal Government.

Even if YOUR SHOVEL *(regardless of make)* had the same engine as used on a NORTHWEST of the same rated capacity the NORTHWEST would still have *more cutting force at the Dipper Lip!*



Because, in the Northwest Independent Crowd, the hoist cable is dead-ended at the inner end of the dipper sticks instead of at the boom head, it utilizes what on other shovels is dead-end pull, and turns forces to crowding that other shovels waste. This permits the utilization of engine power for hoisting, that on other shovels, must go for crowding.

Your Northwest always has power in excess of other machines for the tough places.

Built in a range of **10 SIZES** *½ yd. capacity and larger*

NORTHWEST ENGINEERING COMPANY

The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers

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NORTHWEST

SHOVELS ●
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PULLSHOVELS ●
SKIMMERS ●

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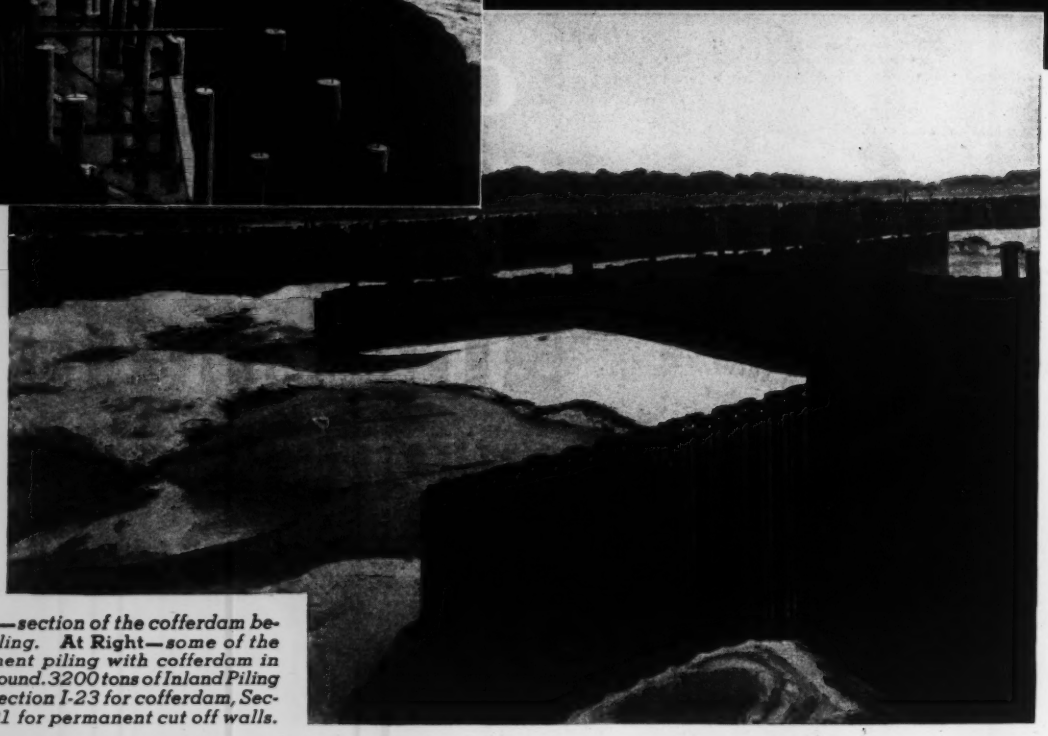
Gasoline ●
Oil ●
Diesel ●
Electric ●

Contractors Rely on Inland Piling for Mississippi Waterway



NRA CODE

At Top—*section of the cofferdam before filling.* **At Right**—*some of the permanent piling with cofferdam in background. 3200 tons of Inland Piling used: Section I-23 for cofferdam, Section I-31 for permanent cut off walls.*

● Pictured above are views of one of the many lock and dam jobs on the great Mississippi River 9-foot channel project on which leading contractors have used Inland Steel Sheet Piling.

On this particular job, Lock No. 7, Dresbach, Minn., (also Lock No. 26, Alton, Ill.,) a new type of cofferdam construction, suggested by Inland, was used. This cellular type of cofferdam is braced with fabricated frames instead of the usual crosswalls of sheet piling, providing economy in steel and a construction capable of hydraulic filling, while retaining all the advantages of cellular construction.

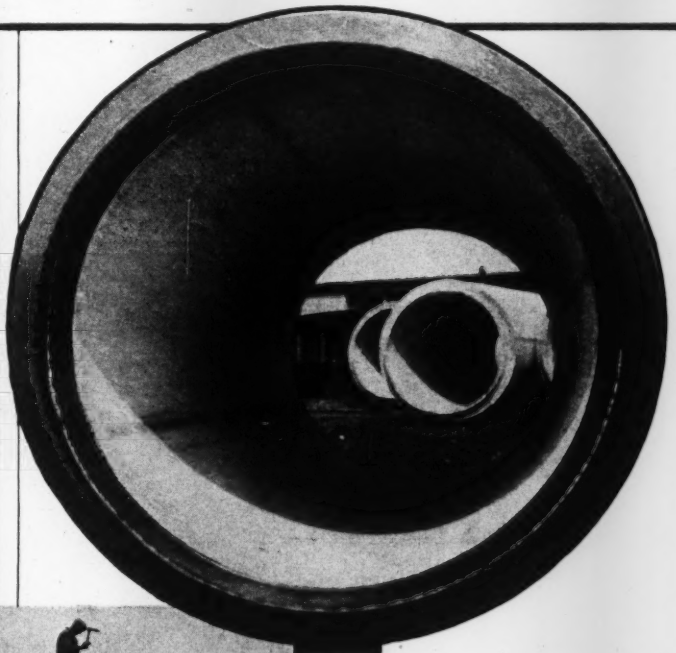
Such helpful cooperation is always available from Inland. Write for the new Inland Sheet Piling Catalog No. 3. INLAND STEEL COMPANY, 38 So. Dearborn St., Chicago, Ill.

INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Strip Tin Plate Plates Structurals Piling Rails Track Accessories Bars Rivets Billets

LET'S GET THE INSIDE FACTS



Pressure Subaqueous Sewer Culvert

THE inside surface of every length of Lock Joint Reinforced Concrete Pressure Pipe presents a handsome appearance. It is clear, dense, hard and SMOOTH.

This smoothness assures the High Carrying Capacity of the finished pipe line of which these lengths are to become a part.

Furthermore this smoothness will continue for the life of the pipe line, 80 or 100 years or more. The rich, dense concrete of which the pipes are made, permanently prevents corrosion or tuberculation, those arch enemies of Long Life and High Carrying Capacity.

Be guided by the INSIDE FACTS.

LOOK INTO Lock Joint Concrete Pipe.

LOCK JOINT PIPE CO.—EST. 1905—AMPERE, N. J.

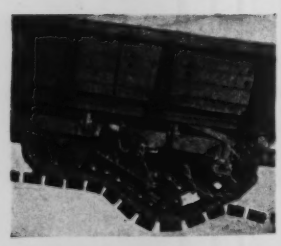
LOCK JOINT *Rein-forced* **CONCRETE PRESSURE PIPE**

KEEPING UP TO SCHEDULE...

keeping down the costs

LINN TRACTORS

LINN Products Are Patented



LINN'S flexible traction unit assures full road contact at all times. No matter how tough the floor the LINN pulls through with a capacity payload.

The tough haulage months of winter and spring are with us. Will your jobs move along on schedule . . . or will your haulage equipment be *counted out* by snow, ice and mud . . . seriously delaying your jobs and adding heavily to your costs? Not if you use LINN haulage . . . for *any weather is working weather* for LINN. The LINN patented flexible traction unit pulls through with capacity payloads, regardless of the footing or weather. There is no *time out* for LINN. And LINN earns more, even on easy jobs, because of its huge payload capacity, high speed and ability to stand punishment. Information is ready relative to operating costs for both gas and Diesel powered LINNS. It shows yardage costs far lower than you ever have experienced in hauling. Send for this data.

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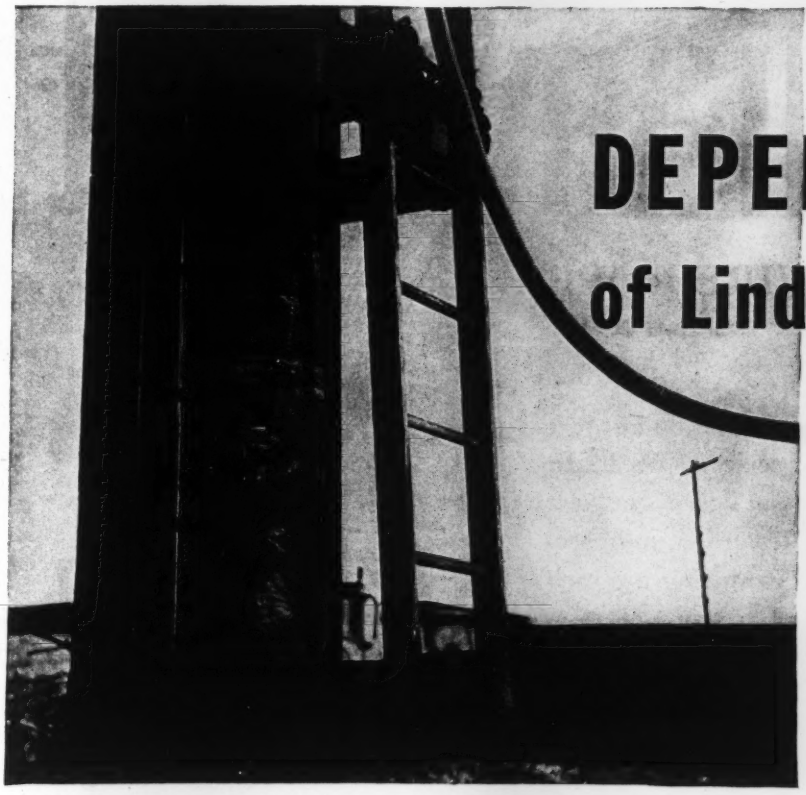
Linde Process Service proves the DEPENDABILITY of Lindewelded Pipe for FIRM Foundations



● GOING DOWN—Lindewelded sections of 16-in. steel pipe piling surely reach bed rock without danger of crushing from 4-ton blows of steam hammer.

IN the construction of a modern steel and concrete building on soft ground, plans called for 250 steel pipe piles, concrete filled, in groups ranging in depth from 25 to 60 feet. Altogether, 13000 feet of 16-in. pipe were necessary. These piles were required to withstand the sudden stresses from 4-ton blows of a steam hammer. The pipe dealer called on Linde Process Service for assistance in jointing short lengths of pipe for this purpose.

The pipe had to be strongly joined to permit driving without any chance of crushing, bending or warping. A Linde Service Operator demonstrated the Lindeweld method of making the pipe jointless. Results convinced the pipe dealer and the pile driving contractor—and the pipe was oxy-acetylene welded.

Linde Process Service is practical assistance given to users of Linde Oxygen—at no extra cost—in the application of the oxy-acetylene process of welding and cutting. It brings a background of sound procedure based on thousands of experiences in many industries. Its effectiveness is further amplified by the extensive research and engineering facilities of Units of Union Carbide and Carbon Corporation.

Ask your nearest Linde Sales Office about this service. These are located in Atlanta—Baltimore, Birmingham, Boston, Buffalo, Butte—Chicago, Cleveland—Dallas, Denver, Detroit—El Paso—Houston—Indianapolis—Kansas City—Los Angeles—Memphis, Milwaukee, Minneapolis—New Orleans, New York—Philadelphia, Phoenix, Pittsburgh, Portland, Ore.—St. Louis, Salt Lake City, San Francisco, Seattle, Spokane and Tulsa.

Everything for oxy-acetylene welding and cutting—including Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through producing plants and warehouse stocks in all industrial centers.

PRODUCT OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

The Linde Air Products Company

Unit of Union Carbide and Carbon Corporation

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Dominion Oxygen Co., Ltd. Toronto

YOU CAN ORDER EVERYTHING FOR OXWELDING AND CUTTING FROM LINDE

When it's tough going—

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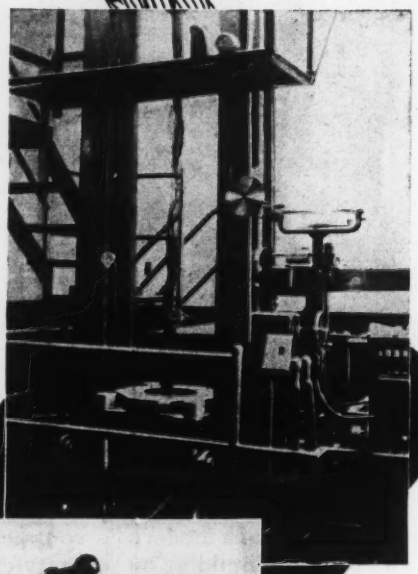
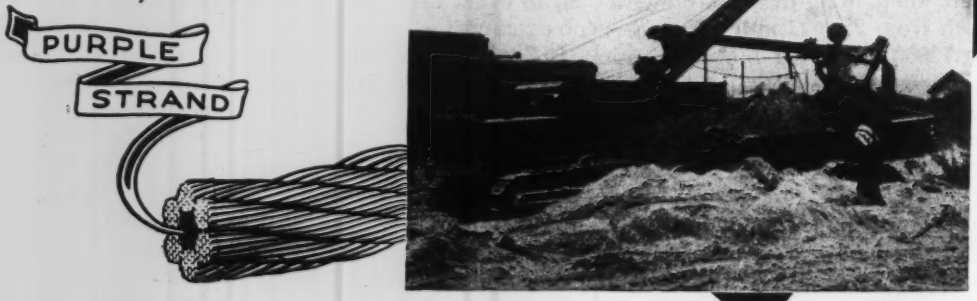
the WIRE ROPE

with the reputation for doing a GOOD JOB!

We make sure of the quality of Williamsport Wire Rope by a gruelling series of tests. In the picture at the right you'll see one test by a two story strength tester—a split second photo—in the act of rupturing a 3-inch rope. This is only one of a score of tests made on our ropes you put into service—



Many of which are exclusive with Williamsport. Why not try Williamsport on your next replacement and discover this quality for yourself.



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WIRE ROPE COMPANY

Main Office and Works—Williamsport, Pa. Branch Sales Offices: 122 S. Michigan Ave., CHICAGO, ILLINOIS

THIRTY-FIVE YEARS *between* INSPECTIONS

The Story

Back in 1899, the three year old youngster in the upper photograph posed proudly in the picture taken by his father, then Chief Engineer of the Company. He was making his first inspection of the new Asphalt Block Pavement on West 183rd Street, New York City.

For thirty - five years, through rapidly changing transportation conditions, these Asphalt Blocks have carried a heavy volume of metropolitan traffic. They are still in fine condition. But the light foundation under the original pavement has proved unequal to the strain of today's high-speed motorized traffic, and a new Asphalt Block Pavement on a heavy modern foundation has been ordered.

So once again, thirty-five years after his first inspection, this same youngster now grown to manhood—this time in his capacity of Executive Vice President in charge of manufacturing—looks over the old pavement. For upon him devolves the responsibility of making the new blocks to be laid on the same street.

Asphalt Blocks have always been non-slippery. When West 183rd Street, in New York City, pictured above, was paved in 1899, one of the considerations in the selection of Asphalt Blocks for the steep grade was the firm foothold for horses which their gritty, non-polishing surface provided.

With the coming of the automobile and the mounting toll of skidding accidents, mere skid-resistance was not enough. Public safety demanded the *elimination* of skidding—especially on steep hills, bad curves and congested intersections where the menace was greatest.

To meet this demand, *Asphalt Block Non-Skid Construction* with its scientifically planned recessed joints was devised. Its principle proved correct; its success was instant; its use year after year has shown progressive increase.

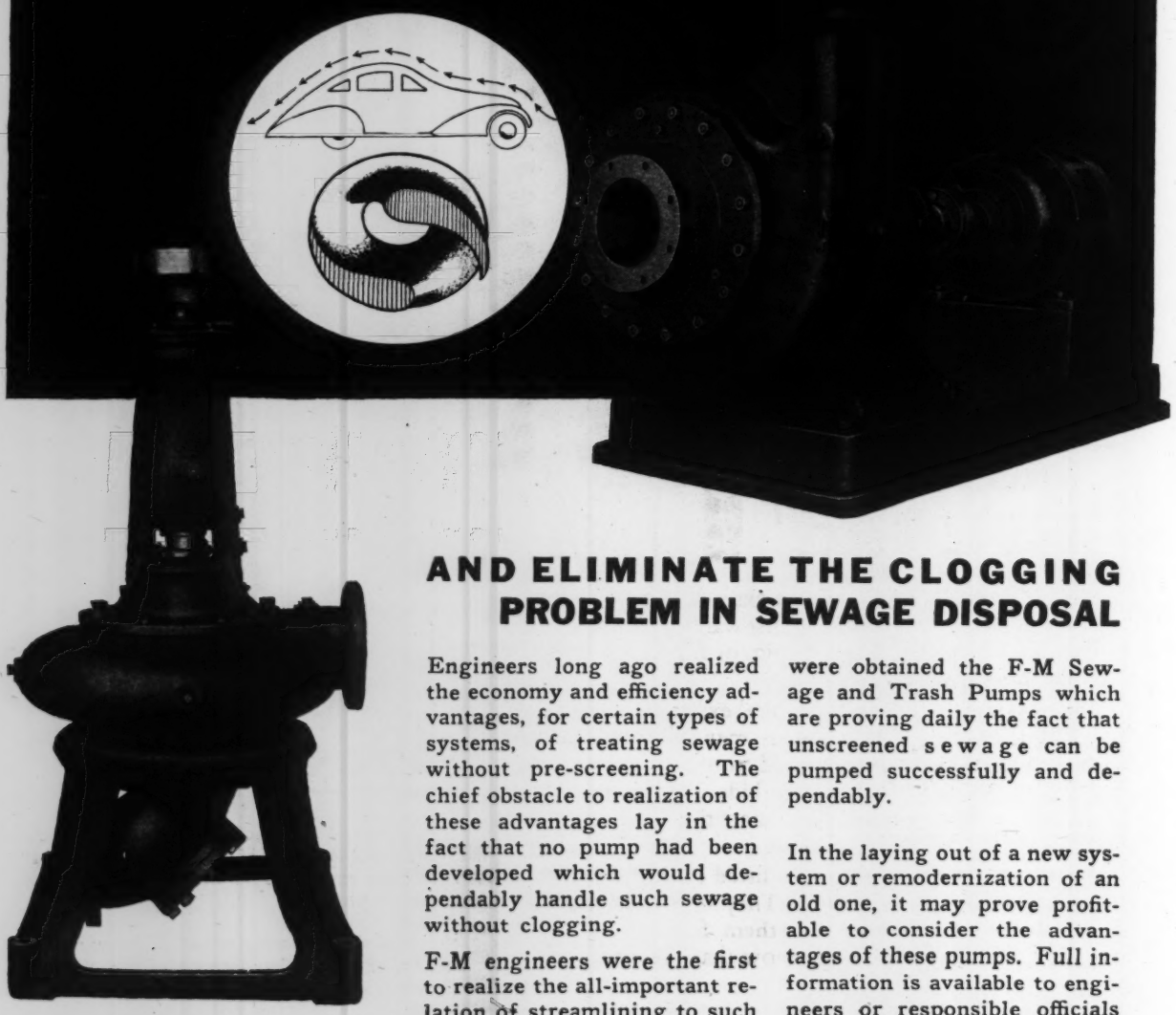
So in 1934, when the old foundation under this pavement proved inadequate, the City authorities did the obvious thing—they ordered the 10% grade paved with Asphalt Block Non-Skid Construction.

The HASTINGS PAVEMENT COMPANY

25 Broad Street, New York, N. Y.

HASTINGS ASPHALT BLOCKS

FIRST TO *Streamline!*



AND ELIMINATE THE CLOGGING PROBLEM IN SEWAGE DISPOSAL

Engineers long ago realized the economy and efficiency advantages, for certain types of systems, of treating sewage without pre-screening. The chief obstacle to realization of these advantages lay in the fact that no pump had been developed which would dependably handle such sewage without clogging.

F-M engineers were the first to realize the all-important relation of streamlining to such a design problem. Well-rounded cutwaters, streamlined impeller blades, smooth passages from intake to discharge—by these methods were obtained the F-M Sewage and Trash Pumps which are proving daily the fact that unscreened sewage can be pumped successfully and dependably.

In the laying out of a new system or remodernization of an old one, it may prove profitable to consider the advantages of these pumps. Full information is available to engineers or responsible officials without charge. Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago. 32 Branches at your service throughout the United States.

Pioneer Designers and Manufacturers of POWER, PUMPING AND WEIGHING EQUIPMENT 104 Years

FAIRBANKS-MORSE PUMPS

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EYE HAZARDS have an extra danger for the new and inexperienced man. His first warning of danger may be the flying chip that robs him of his sight—and robs *you* of your profit.

The lost time, medical and hospital expenses that follow a single serious eye accident may cost you the profit on an entire contract—and, through increased insurance rates, affect your future bids. New men . . . or veterans . . . make sure they *all* start the day right—*every* day, *with their goggles in place.*

There are AO Goggles exactly fitted to the needs of each man and his particular job. They are strong, cool, comfortable. Men like to wear them for they know that their *eyes are safe.* And *you* know that the company profits are *secure.*

Send for an AO Industrial Representative today. He will help you plan a practical—and highly profitable—eye-safety program.

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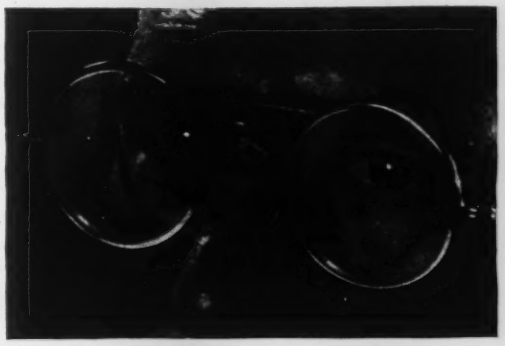
AO Open-Frame Goggles are as comfortable as ordinary spectacles—provide efficient eye protection for riveting, chipping, paint cleaning, drilling, reaming and many other eye-hazardous jobs. Their Super-Armorplate lenses have greater impact resistance than any other standard lens—far greater strength than the U. S. Bureau of Standards specifies.



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The Simple, Practical Principle of TIMKEN BITS eliminates all Reforging Costs

Note that the steel does not bottom in the bit—another reason why the threads are not subjected to wear or damage.

Note how the bit is driven into the rock—against a solid upset shoulder on the steel. No strain on threads.

THE special type of screw threads used to attach Timken Bits to the steel assures easy, quick bit replacement at all times when necessary.

On account of their formation, these threads cannot easily be injured by the hardest drilling. To further protect the threads and bits, an upset shoulder on the steel is provided to take the impact of the hammer blows. The steels do not bottom in the bits under any conditions.

This simple principle makes the removable bit thoroughly practical for all purposes. Combined with correctly-designed bits of Timken fine-grained electric furnace steel it radically reduces drilling costs in all types of rock—above or below ground.

One good trial of Timken Bits will convince you of their economy and other benefits. Write for the Timken Bit booklet.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN BITS

This rigid frame concrete bridge is one of two built in 1934 by Road Commissioners of Wayne County, Michigan. Built on piles, the bridge has a clear span of 60 feet, a 40-foot roadway and two 6-foot sidewalks

RIGID FRAME CONCRETE BRIDGES

cut grade separation costs

Before you plan any grade separation project, weigh these advantages of the rigid frame concrete bridge.

1. *Saves Headroom*—Deck ½ to ⅓ shallower, reducing excavation, fill and structural quantities. Drainage and appurtenance problems simplified.

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3. *Ultimate Economy*—Structural simplicity further reduces first cost, saves maintenance and assures long life. Adaptable to future widening.

4. *Pleasing Appearance*—Such graceful clean-cut spans as the one shown are contributing to a new standard of bridge architecture.

Short-cut formulae have simplified rigid frame bridge design. Modern methods of making and placing concrete, together with new information on structural details of concrete bridges, make this type of construction ideal for your grade separation program. A new edition of the 40-page "Analysis of Rigid Frame Bridges" (replacing your present edition) is just off the press. Presents simplified procedure for preliminary design, and other results of recent studies. Check the coupon and mail for your free copy of this and other booklets you want.

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- ☐ Analysis of Rigid Frame Concrete Bridges
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Organization.....
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Spearfish Project Emphasizes Value of PWA and Mono-Cast Pipe

Mono-Cast Pipe being installed in new supply line for Spearfish, S. D.

Governmental financial assistance through the PWA relieved a real emergency for the town of Spearfish, S. D. Collapse of their water supply line, composed of a substitute for cast iron pipe, left the community depending for its water on a few small springs, entirely inadequate for domestic and fire protection purposes. With PWA help, a new line has just been completed which not only assures Spearfish of an adequate water supply but also during its construction acted as a local unemployment relief measure besides providing 5,250 man-hours of work in the fabrication of the materials used.

Approximately four miles of 10- and 12-inch Mono-Cast Pipe were specified for the new line, which lay through extremely rugged, rocky terrain as indicated in the accompanying photograph. The pipe had to be hauled several miles by truck from the nearest railroad station, then transferred to rock sleds for the last lap to trench side. It was then installed by inexperienced relief labor. In spite of these handicaps, the installation was completed rapidly and economically and is now in service—testifying to merit of Mono-Cast Pipe as well as to the PWA plan which made the installation possible.

Find Out What the PWA Can and Will Do for Your Local Waterworks and Sewage Disposal System. Acipco Will Gladly Help!

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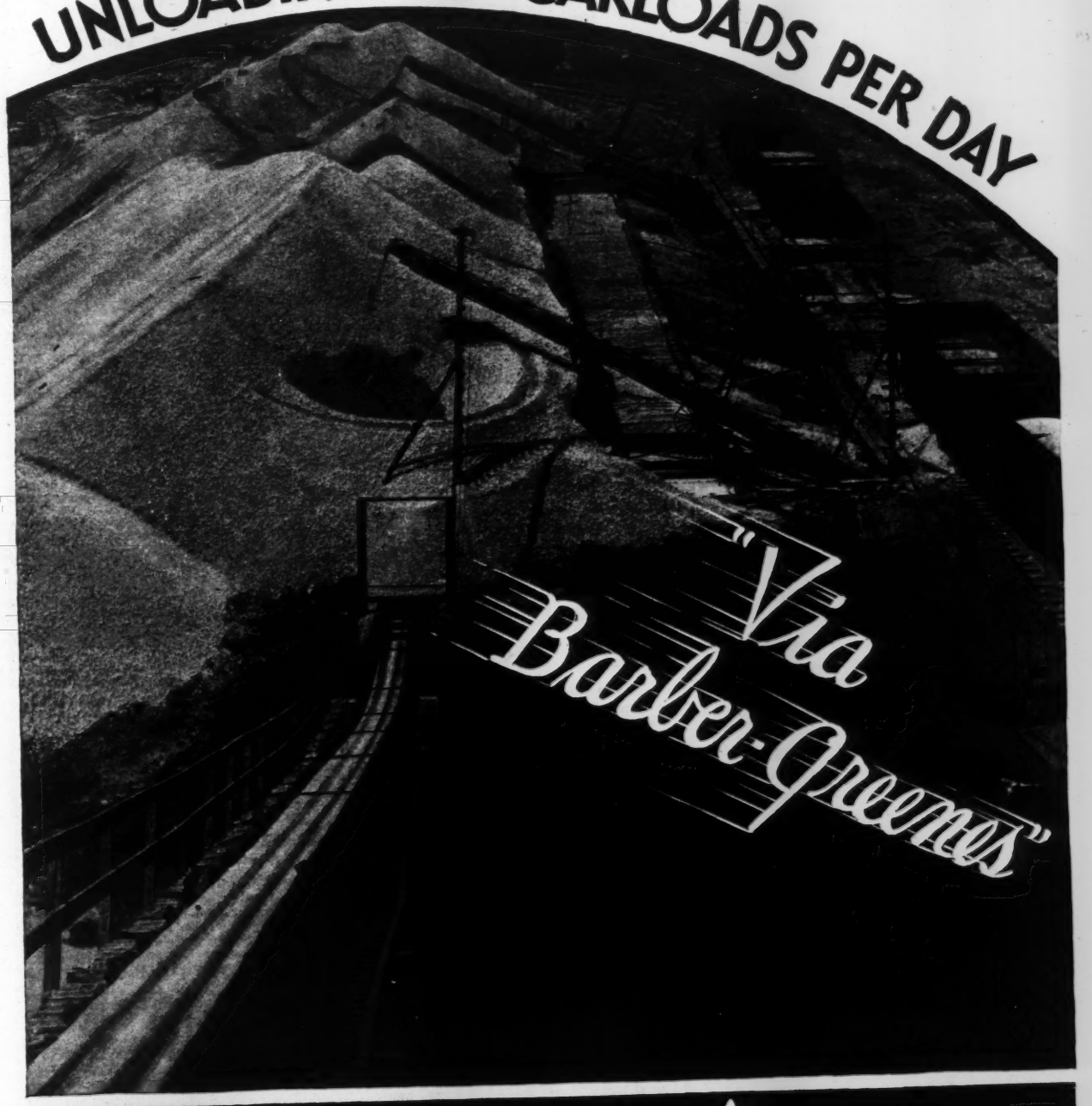

THIS is one of the many Barber-Greene installations where ingenuity of layout greatly enhances the value of the machines. The two B G Portable Belt Conveyors, which unload the cars and store the material, are mounted on auxiliary trucks. These trucks run on industrial track parallel to the switch track—thus facilitating easy movement of the conveyors along the unloading section.

Sand and two sizes of stone are stored, and the permanent conveyor shown on the left receives the desired material through a series of gates beneath the pile. Material is unloaded by the two Barber-Greenes at the rate of 40 carloads per day.

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BALLOTS like this are being published this month in many business papers affiliated with The Associated Business Papers, Inc.—reaching virtually all key men in every line of industry, trade and profession throughout the nation.

BUSINESS men, nationally, may appreciate an opportunity to express their convictions to a strictly non-partisan and impartial body—with the assurance that by so doing, business views will be presented effectively to the political, banking, industrial, business and labor leaders of the country.

QUESTIONS on the economic ballot below are prefaced with "In your line of business" to make possible an industry by industry study as well as a consensus of business opinion in all fields of industry—so let our industry be well represented in the responses.

ECONOMIC BALLOT

Check your convictions, sign, clip and mail this ballot.

1. As regards the possibility of Congress adopting a universal thirty-hour work week, do you favor such legislation? Yes( ) No( ); and if so on the basis of( ) continuation of existing weekly wages, or ( ) continuation of existing hourly rates of pay.
2. In your line of business are you satisfied with enforcement of maximum hours and minimum wage provisions now in effect? Yes( ) No( )
3. In your line of business is there obtainable ample working capital—from banks? Yes( ) No( ); from government agencies? Yes( ) No( )
4. In your line of business is there obtainable ample investment capital—from banks? Yes( ) No( ); from government agencies? Yes( ) No( )
5. In your line of business do you favor limitation of industrial output—by government control? Yes( ) No( ); by industry control? Yes( ) No( )
6. In your line of business do you favor a plan for control of prices—by a code provision establishing price fixing? Yes( ) No( ); by a code provision establishing an open price plan? Yes( ) No( )
7. In your line of business do you think that government measures now in effect are helping small and medium sized enterprises? Yes( ) No( ); hurting such enterprises? Yes( ) No( )

Sign or not as you please.....

Kind of Business.....

Please return this ballot to:
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c/o The Associated Business Papers, Inc.
330 West 42nd St., New York, N. Y.

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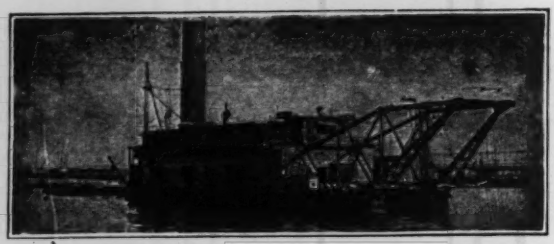

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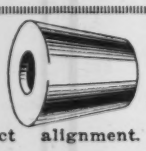

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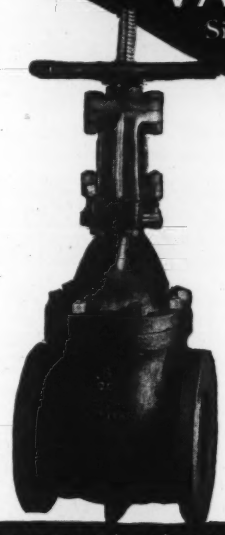

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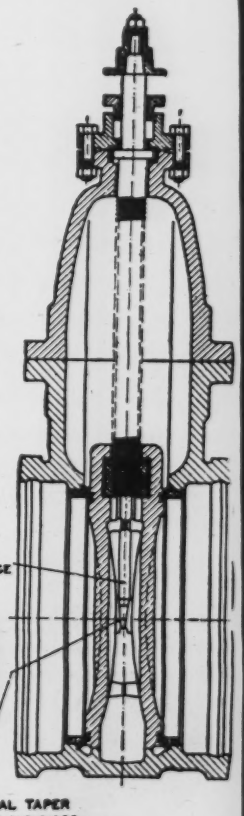

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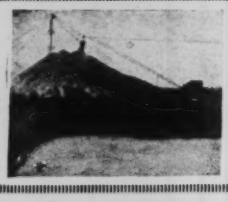

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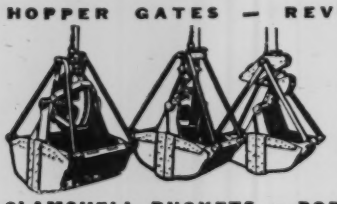

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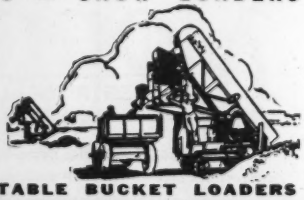

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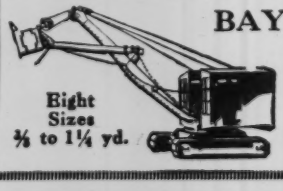

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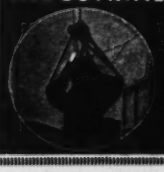

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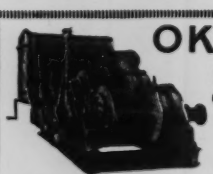

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U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 29, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O., at Danvers, Mass.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2622)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed Bids in duplicate, will be publicly opened in this office at 1 p.m., Feb. 8, 1935, for furnishing all labor and materials and performing all work for *construction of the U.S.P.O. at Woodland, Calif.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin no. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce of other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2620)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.— Sealed Bids, in duplicate will be publicly opened in this office at 1 p.m., Feb. 8, 1935, for furnishing all labor and materials and performing all work for the *construction (except elevators) of the U. S. Ct. H., etc., at El Paso, Texas.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 6 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $50 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $50 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Branch. (2625)

YOU GET national competition on your request for bids in the Official Proposal Columns of

ENGINEERING NEWS-RECORD

OFFICIAL PROPOSALS

Bids: January 10.

Sewage Treatment Plant

CITY OF ASBURY PARK, N. J.

Sealed proposals for the construction of a Sewage Treatment Plant for the City of Asbury Park, N. J., consisting of concrete settling tanks, the conversion of the existing septic tank into a separate sludge digestion tank, new ventilating stack and the necessary appurtenances will be received by the City Manager at the City Offices, 710 Bangs Avenue, Asbury Park, N. J., until three o'clock P. M., on the Tenth day of January, 1935, at which time and place they will be publicly opened and read.

Each proposal must be accompanied by cash or a certified check made payable to the City of Asbury Park, New Jersey, for not less than five percent (5%) of the amount bid.

A bond in the amount of one hundred percent (100%) of the contract price issued by a Bonding Company authorized to do business in the State of New Jersey, will be required.

Plans and specifications are on file and may be examined at the offices of the City Manager, 710 Bangs Avenue, Asbury Park, New Jersey, and copies of same may be obtained from the Consulting Engineers, Remington, Vosbury and Goff, 509 Cooper Street, Camden, New Jersey, upon a deposit of Twenty-five Dollars ($25.00) half of which deposit will be refunded upon return of the plans and specifications in good condition on or before January 17th, 1935.

The Mayor and Council reserves the right to determine upon the qualifications of the bidder to comply with the plans and specifications and to reject any or all bids.

CARL H. BISCHOFF.
City Manager.

Bids: February 6.

Intercepting Sewer

Aurora, Ill.

Sealed bids for Aurora Sanitary District Southeast Intercepting Sewer will be received at room 410 Keystone Building, Aurora, Illinois, up to 10:00 o'clock A.M. on February 6, 1935. Work consists of about 14,820 lineal feet of 24" to 33" vitrified clay tipe pipe, about 1040 lineal feet of 24" to 30" cast iron pipe, river crossing 330', etc. See official advertisement published in Aurora Daily Beacon News on December 28th, 1934, for particulars, or see W. E. Deuchler, Engineer, City Hall, Aurora, Illinois.

Bids: January 3.

Postponement of Bid Date

Jackson, Mich.

Notice is hereby given that the time for receiving bids for the construction of a complete Sewage Treatment Plant for the City of Jackson, Michigan will be extended to January 3, 1935 at 10 A.M. Eastern Standard Time instead of December 20th, 1934 as previously advertised.

P. E. CAMPBELL,
City Manager.

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed Bids, in duplicate will be publicly opened in this office at 1 p.m., Feb. 4, 1935, for furnishing all labor and materials and performing all work for the *construction of U.S.P.O. at Wheatland, Wyo.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2619)

OFFICIAL PROPOSALS

Bids: January 14.

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commission for:

ROUTE 23, SECTION 14

Construction of Route 23, Section 14, from Passaic River to Route 6 (Relocation and Traffic Circle), Passaic County, Length 1.0 miles.

ESTIMATED:

13,458 cu.yds. unclassified excavation
28,212 cu.yds. borrow
30,000 sq.yds. 9" rein-conc. pavement
1 small span stream bridge.

ROUTE 31, SECTION 4A

Construction of Route 31, Section 4A, Somerville By-Pass, Somerset County, Length 1.830 miles.

ESTIMATED:

40,569 cu.yds. unclassified excavation
34,278 sq.yds. 9" rein.-conc. pavement
1,266 lin.ft. 5'x5' rein.-conc. storm drain
1 small span culvert extension.

Bids for the above will be received at the office of the State Highway Commission, State House Annex, Trenton, New Jersey, on Monday, January 14th, 1935, at twelve o'clock Noon, Eastern Standard Time, and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commission. Bidders must submit a revised financial statement and statement of plan and equipment with their bid.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, New Jersey, and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to the State Highway Department, Room 102, State House Annex, Trenton, New Jersey. Bids must be made on the standard proposal forms in the manner designated in the standard specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. Copies of the standard proposal forms and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

Bids: January 4.

Pennsylvania Department of Highways, Harrisburg, Pennsylvania. Bids will be received January 4, 1935, for the construction of 14 road projects, totaling approximately 19 miles; construction to be reinforced concrete, bituminous "E," bituminous "A," vitrified brick and relaid granite block. Projects situated in the following counties:

*Allegheny	*Delaware
*Blair	*Lancaster
*Bucks-Philadelphia	*Philadelphia
*Chester	*Westmoreland
*Dauphin	

*National Recovery Projects.

Full particulars upon application to S. S. Lewis, Secretary of Highways, Harrisburg, Pennsylvania.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, (Federal Emergency Administration of Public Works Project) Washington, D. C., December 11, 1934. Sealed bids (Specifications No. 608) will be received at the office of the U. S. Bureau of Reclamation, Almira, Washington, until 10 a.m., January 16, 1935, and will at that hour be opened for furnishing labor and materials and performing all work for the *construction of two dormitory buildings* at the Government camp at Grand Coulee Dam, Columbia Basin project, Washington. The work is located about 22 miles northwest of Almira, Washington. The dormitory buildings will be one and one-half story, L-shaped buildings, approximately 35 feet 6 inches by 112 feet in size with a wing approximately 35 feet by 35 feet in size. The foundations will be concrete and the outside walls will be of wood frame construction covered on the outside with sheathing and siding and on the inside with metal lath and plaster. Interior partitions and ceilings will be covered with metal lath and plaster. The roofs will be covered with wood shingles over sheathing. The schedule provides for lump sum bids for the construction of the dormitory buildings except excavation and concrete and for unit prices per cubic yard for excavation and concrete. The installation of plumbing, heating, and electrical facilities will be included in the lump sum price bid for the construction of the dormitory buildings. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. Bid security in an amount not less than 10 per cent and performance bond not less than 50 per cent will be required. The charge for copies of the specifications and drawings is $2.50, not returnable. For particulars, address the Bureau of Reclamation, Almira, Washington; Denver, Colorado; or Washington, D. C. ELWOOD MEAD, Commissioner. (2613)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1:00 p.m., Jan. 25, 1935, for furnishing all labor and materials and performing all work for *construction of the U. S. P. O. at Hollister, Calif.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (265)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 17, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Indianola, Miss.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (269)

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 29, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Gloucester City, N. J.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding three sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2624)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 18, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Marysville, Kan.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (268)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 25, 1935, for furnishing all labor and materials and performing all work for *construction of U. S. P. O. at Mechanicville, N. Y.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin no. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2623)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 14, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Red Lion, Pa.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 2 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $25 is made for each set to assure its prompt return. One set will be furnished builders' exchanges,

U. S. Government

chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $25 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (266)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Feb. 4, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O., at Windsor, Mo.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (264)

U. S. ENGINEER OFFICE, Wilmington, N. C. Sealed bids, in duplicate, will be received at this office until 12 o'clock noon, January 11, 1935, and then publicly opened for furnishing all labor and materials and performing all work for *dredging* approximately 57,900 cubic yards in the *Cape Fear River, N. C.*, above Wilmington under the provisions of the National Industrial Recovery Act. Further information on application. (263)

WAR DEPARTMENT, U. S. Engineer Office, Puerto Rico District, 39 Whitehall Street, New York, N. Y. Sealed Bids will be received at this office and/or at U. S. Engineer Office, Arsenal Building No. 1, San Juan, Puerto Rico, until 11 A.M., Eastern Standard Time, January 7, 1935, and then publicly opened, for *dredging* approximately 1,597,000 cubic yards of material in *San Juan Harbor, Puerto Rico.* (2322)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed Bids, in duplicate will be publicly opened in this office at 1 p.m., Jan. 25, 1935, for furnishing all labor and materials and performing all work for the *extension and remodeling of the U.S.P.O., Butler, Pa.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement Public Works Branch. (2621)

UNITED STATES ENGINEER OFFICE, 615 Commerce Bldg., St. Paul, Minn.—Sealed bids for furnishing *locomotive cranes for Lock and Dam Nos. 4, 5, 5A, 6, 10, 16 and 20, Mississippi River*, will be received at this office until 2 p.m., January 10, 1935, and then publicly opened. Further information upon application. (2610)

U. S. ENGINEER OFFICE, P. O. Box 59, Louisville, Ky.—Sealed bids will be received until 2:00 p.m. (C.S.T.) January 15, 1935 and then opened, for furnishing a *24" dredge pump and spare parts.* Further information on request. (2618)

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U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate, will be publicly opened in this office at 1 p.m. Jan. 11, 1935, for furnishing all labor and materials and performing all work for construction of the *U. S. P. O., at Zeeland, Mich.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (255)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate, will be publicly opened in this office at 1 p.m., Jan. 11, 1935, for furnishing all labor and materials and performing all work for the construction of the *U. S. P. O. at Fredonia, Kans.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (253)

WAR DEPARTMENT: United States Engineer Office, Galveston, Texas. Sealed bids will be received until 2 P.M., January 14, 1935, and then publicly opened for furnishing all labor and material and performing all work required for *dredging* about 1,510,000 cubic yards of material from the Houston Ship Channel, Texas, from Station 520/00 (Mouth of Carpenter's Bayou) to Station 830/00 (Mouth of Greens Bayou) and from Station 1245/00 (about 1 mile below the turning basin) to and including the turning basin. Further information on application. (258)

Proposal for construction of Combination Highway-Railway Bridge.—U. S. Engineer Office, Charleston, S. C.—Sealed proposals, in duplicate, will be received at this office until 12 o'clock, noon, January 10, 1935, and then publicly opened, for the *construction of a rolling lift span highway-railway bridge* with road and railroad connections across the Intracoastal Waterway near Myrtle Beach, S. C. (257)

UNITED STATES ENGINEER OFFICE, 615 Commerce Bldg., St. Paul, Minn.—Sealed bids for furnishing *traveling Tainter gate hoists for Lock and Dam Nos. 4 and 5, Mississippi River*, will be received at this office until 2 P.M., December 28, 1934, and then publicly opened. Further information upon application. (256)

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m. Jan. 4, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Richwood, W. Va.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (254)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 8, 1935, for furnishing all labor and materials and performing all work for the construction of the *U.S.P.O. at Herington, Kan.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2510)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate will be publicly opened in this office at 1 p.m., Jan. 17, 1935, for furnishing all labor and materials and performing all work for the construction of the *U. S. P. O., at Covington, Ga.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (251)

U. S. ENGINEER OFFICE, Rock Island, Illinois.—Sealed bids, in duplicate, will be received at this office until 2:00 p.m., January 9, 1935, and then publicly opened, for furnishing all plant, labor and materials for and constructing a *dam and service bridge at Lock and Dam No. 10, Mississippi River, Guttenberg, Iowa.* Further information on application. (245)

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OFFICIAL PROPOSALS

New Orleans, October 26, 1934.

Sealed proposals will be received by the Sewerage & Water Board of New Orleans, at the office of the Purchasing Agent, Room 502, No. 526 Carondelet St., New Orleans, up to 12 o'clock, noon (C.S.T.) of the dates indicated below, for the following construction contracts, which constitute P.W.A. Project No. 4284:

GROUP "B"—Bids to be opened January 3, 1935.

219-D Lined and covered drainage canal and pipe line in S. Claiborne Ave., from Nashville Ave. to Leonidas St.

220-D Concrete pipe lines in South and North Olympia St. between Orleans and Banks Sts., in Murat St. between Palmyra and Banks Sts., in Banks St. between Olympia St. and S. Carrollton Ave., and in St. Claude St. between Poland and Japonica Sts.

130-D Installation of underground power cable from Power House 2 to Stn. 1; from Stn. 1 to Stn. 2 and from Power House 2 to Stn. 6.

GROUP "C"—Bids to be opened January 10, 1935.

221-D Lined and covered drainage canal and pipe lines in Lamarque, Whitney, Numa and Genl. Meyer Ave. from Stn. 8 to Saux Lane.

222-D Concrete lined and covered canal in Genl. Taylor St. from Broad to Willow Sts.

223-D Drainage pipe line in Jefferson Ave. from S. Claiborne Ave. to McKenna St.

203-W Furnishing cast iron water pipe and appurtenances.

204-W Installing 30" water mains in Magnolia and other streets.

131-D Installing underground cable from Stn. 3 to Stn. 7 and from Stn. 7 to Stn. 6.

GROUP "D"—Bids to be opened January 17, 1935.

224-D Partly lining and partly widening and deepening London Ave. Outfall Canal from Stn. 3 to Lake Pontchartrain; and lining and covering Broad St. Canal from Bruxelles St. to Stn. 3.

Plans and specifications may be obtained at the office of the Board on and after November 27, 1934. A payment of $5.00 will be required for each set of plans and specifications issued for each contract. Not less than minimum wage rates established by P.W.A. must be paid and all bids accompanied by certificate of compliance with applicable code, or, if none, with President's Re-employment Agreement.

BRYSON VALLAS, Gen'l. Supt.
A. G. MOFFAT, Secretary.

Bids, January 11.

High Speed Line

DELAWARE RIVER JOINT COMMISSION

Sealed bids will be received for furnishing materials, and for the construction of a building in Camden, New Jersey to house sub-station equipment for the high-speed rail transit line to be identified as Contract No. 7-C at the office of the Secretary of the Joint Commission, Administration Building, Bridge Plaza, Camden, New Jersey until 1:30 o'clock P.M. Eastern Standard Time, Friday, January 11th, 1935, and then and there will be publicly opened and read.

A more complete description of the work and full information for bidders is given in the specifications and contract drawings which may be obtained upon deposit of $25.00 which will be remitted upon the receipt of bid or the return in good condition of the copies so taken within thirty days after the opening of bids.

All bids shall be accompanied by a Certificate of Compliance, Form No. P.W.A. 61, properly executed by the bidder.

Contractors shall pay all employes directly employed on the work the following minimum rates of wage, as prescribed by the Federal Emergency Administration of Public Works: Skilled, $1.20 per hour; unskilled, $0.50c. per hour, and semi-skilled and others as called for in the specifications.

The Contract is subject to the approval by the Federal Emergency Administration of Public Works. The right is reserved to reject any or all bids.

GIFFORD PINCHOT, Chairman.
JOSEPH K. COSTELLO, Secretary.
THE DELAWARE RIVER JOINT COMMISSION,
CAMDEN, NEW JERSEY.

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 16, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Prosser, Wash.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2617)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 22, 1935, for furnishing all labor and materials and performing all work for the *extension and remodeling of the U. S. P. O. at Huron, S. D.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2616)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Feb. 13, 1935, for furnishing all labor and materials and performing all work for the *extension and remodeling of the U. S. P. O. at Baker, Ore.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specification, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (262)

TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENNESSEE. Sealed bids, in duplicate, will be received until 10 a.m., central standard time, January 9, 1935, and then publicly opened, covering furnishing, fabricating, shop-painting and delivering one (1) each 100-ton *Stiffleg Freight Transfer Derrick* for Wilson Dam and for Wheeler Dam. Bid forms, specifications and other information available at above office December 26, 1934. C. H. Garity, Director of Purchases. (2612)

U. S. ENGINEER OFFICE, Sub-office No. 1, Foot of Arsenal St., St. Louis, Mo. Sealed bids will be received until 11:00 a.m., Jan. 3, 1935 and then opened, for furnishing to *U. S. Engineer Depot, Foot of Arsenal St., St. Louis, Mo.*, 160 sections (2240 lin.ft.) of 20" light discharge pipe. Further information upon application. (2611)

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 16, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Danielson, Conn.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2615)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 23, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Hyattsville, Md.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2614)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids, in duplicate, will be publicly opened in this office at 1 p.m., Jan. 18, 1935, for furnishing all labor and materials and performing all work for *construction of the U. S. P. O. at Plant City, Fla.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin no. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (261)

TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENNESSEE. Sealed bids, in triplicate, will be received at the office of the Director of Purchases until 10:00 a.m. C.S.T., January 21, 1935: for *furnishing, fabricating, shop-painting, and delivering Service and Emergency Gates, Gate Tracks, and Guides and appurtenances for Turbine Inlets; and Bulkhead Gates, Gate Guides, and appurtenances for the Draft Tube Outlets, for Wheeler Power Plant.* Bidding forms, specifications, and so forth available December 29, 1934. A charge of $5.00, which will not be refunded, will be made for the above documents. C. H. Garity, Director of Purchases. (267)

Additional Official Proposal Ads on page 41

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate will be publicly opened in this office at 1 p.m., Jan. 28, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O. at Tuskegee, Ala.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch. (2515)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate, will be publicly opened in this office at 1 p.m., Jan. 11, 1935, for furnishing all labor and materials and performing all work for *construction of the U.S.P.O. at Iron Mountain, Mich.* Attention is directed to the special conditions of bidding set forth in the specifications, and bulletin No. 51 of the Federal Emergency Administration of Public Works and Executive Order No. 6646. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. Reynolds, Assistant Director of Procurement, Public Works Branch. (2511)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C.—Sealed bids in duplicate will be publicly opened in this office at 1 p.m., Jan. 11, 1935, for furnishing all labor and materials and performing all work for the *construction of the U. S. P. O., at De Ridder, La.* Attention is directed to the Executive Order No. 6646, dated March 14, 1934, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding 3 sets, may be obtained at this office in the discretion of the Assistant Director of Procurement, Public Works Branch, by any general contractor, and provided a deposit of $15 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any subcontractor or material firm interested, and to quantity surveyors, provided a deposit of $15 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the U. S. Cash deposits will not be accepted. W. E. REYNOLDS, Assistant Director of Procurement, Public Works Branch. (2516)

OFFICE OF THE U. S. COMMISSIONER to A Century of Progress, Chicago, Illinois, December 12, 1934.—Sealed proposals will be received at this office until one o'clock p.m. on the tenth day of January, 1935, and then opened, for the *sale and removal of the United States Government Building and Army Camp on Northerly Island, A Century of Progress*, in accordance with the specifications, copies of which may be had at this office. (2512)

WAR DEPARTMENT: United States Engineer Office, Galveston, Texas. Sealed bids will be received until 2 P. M., January 7, 1935, and then publicly opened for furnishing all labor and material and performing all work required for *repairing northeast Jetty, Freeport Harbor, Texas*, by capping with concrete. Further information on application. (249)

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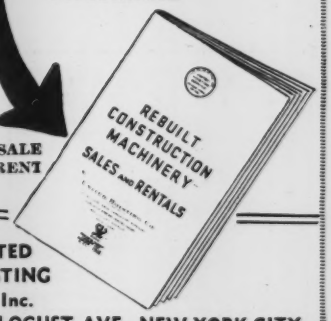

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Directory of Engineers

Cards are arranged alphabetically by States as follows:
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Tests of Materials and Supervision of Construction for Steel and Concrete Structures.
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All Large Cities

(Continued from page 36)

OFFICIAL PROPOSALS

Bids: January 15.

State Highway Work

STATE DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
ALBANY, N. Y.

Sealed proposals will be received by the undersigned at the State Office Building, 13th Floor, Albany, N. Y., until one o'clock p.m. on Tuesday, January 15, 1935, for the construction and reconstruction of highways and bridges in the following Counties, in accordance with the provisions of the National Industrial Recovery Act and Section 1 of the Act of June 18, 1934) (H.R.8781):

Construction	Deposit Required
COLUMBIA & RENSSELAER ..... (18' Gravel Surfacing: 5.90 miles)	$ 2,300
DUTCHESS ..... (18' Gravel Surfacing: 4.75 miles)	2,500
ERIE ..... (59.5' I-beam, Bit. Mac. M.M. Type 3 Appro.: 0.32 miles)	6,700
ESSEX ..... (18' Gravel Surfacing: 2.58 miles)	1,000
ONEIDA ..... (18' Gravel Surfacing; 6.19 miles)	3,300
PUTNAM ..... (18' Gravel Surfacing; 3.10 miles)	1,800
ULSTER ..... (14' Gravel Surfacing; 3.48 miles)	2,300
WESTCHESTER ..... 40' and 45' Bit. Mac. M.M. Opt.; 0.83 miles)	10,000
RECONSTRUCTION ONONDAGA. (Roadside Improvement)	900

Maps, plans, specifications, and estimates may be seen and proposal forms obtained at the office of the Division of Highways in Albany, N. Y., and at the office of the District Engineers in whose districts the roads are located, upon the payment of Five Dollars ($5.00) for the plans and proposal forms, Standard specifications are Two Dollars ($2.00) per copy. No refund will be made on plans, specifications, or proposal forms. Plans and proposal forms may also be seen at the office of the State Department of Public Works, State Office Building, Worth & Center Streets, New York City. The addresses of the District Engineers and counties in each district will be furnished upon request.

Special attention of bidders is called to "General Information for Bidders" in the proposal, specifications, and contract agreement. The attention of bidders is also directed to the special provisions covering sub-letting or assigning the contract and to the use of domestic materials, when financed wholly or in part from funds apportioned under the National Industrial Recovery Act, and Section 1 of the Act of June 18, 1934 (H.R. 8781); and especially called to the fact that the funds for NRH, NRM, and NRS (1935) projects were obtained from the provisions of the National Industrial Recovery Act, and Section 1 of the Act of June 18, 1934 (H.R. 8781), for the purpose of providing employment and hastening industrial recovery.

Proposals for each highway or contract must be submitted in a separate sealed envelope with the name and number of the highway plainly endorsed on the outside of the envelope. Each proposal must be accompanied by cash, draft or certified check payable to the New York State Department of Public Works, Division of Highways, for a sum of at least five per centum and not more than six per centum of the estimate accompanying the plans and specifications, and as specified in the advertisement for proposals and the proposal itself. The retention and disposal of such cash, draft or check by the State Division of Highways shall conform with Subdivision 2, Section 130 of the Highway Law, as amended. The successful bidder will be required to execute the contract and comply in all respects with Section 130 of the Highway Law, as amended. The amount of the certified check accompanying the proposal of the bidder to whom the contract is awarded will be returned when ten per centum of the work under the contract has been completed. If Surety Bond is dispensed with, pursuant to the Highway Law, the amount of the bidding check will be returned when fifteen per centum of the contract work has been completed.

A certificate of compliance on the prescribed form which will be furnished for that purpose shall be signed and submitted by all bidders, in accordance with Executive Order No. 6646, issued by the President on March 14, 1934. Only bids accompanied by such certificate shall be considered or accepted. The contractor to whom award is made shall require subcontractors and dealers furnishing equipment, materials, and supplies to sign similar certificates before making awards to or purchases from such subcontractors or dealers, copies of which shall be furnished to the contracting officer.

On Federal Aid Contracts, when optional types are permitted for any one item of work contractors must state in the space provided in the proposal for this purpose the exact designation of the optional type upon which the proposal is predicated. No one proposal shall contain more than one bid for an optional item. The award, if made, will be on the basis of the responsible proposal which for all items of work gives the lowest total cost for the project and the contract will call for the type designated in such proposal.

Skilled, intermediate grade and unskilled labor on projects under the National Industrial Recovery Act, and Section 1 of the Act of June 18, 1934 (H.R. 8781) shall receive the minimum wage rate per hour as follows: In New York City: skilled labor, eighty cents per hour; intermediate grade labor, sixty-five cents per hour; unskilled labor, fifty-five cents per hour; in the Counties of Nassau, Rockland, Suffolk and Westchester, skilled labor, seventy-five cents per hour; intermediate grade labor, sixty cents per hour; unskilled labor, fifty-five cents per hour; in counties other than Nassau, Rockland, Suffolk and Westchester, and New York City, skilled labor, seventy-five cents per hour; intermediate grade labor, fifty-five cents per hour; unskilled labor, forty-five cents per hour. The minimum hourly rate for the various types of operations and trades shall be set forth in the itemized proposals for each project.

The right is reserved to reject any or all bids.

A. W. BRANDT,
Commissioner of Highways.

EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of Engineering News-Record

This classified index is published as a convenience to the reader. Every care is taken to make it accurate, but Engineering News-Record assumes no responsibility for errors or omissions. If you do not see all you need in the advertising section, we shall be glad to assist you. Write to—

NEWS-RECORD INFORMATION BUREAU
ENGINEERING NEWS-RECORD, *330 W. 42nd St., New York, N. Y.*

See Last Page for Alphabetical Index. See Searchlight Section for Used Equipment

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Linde Air Products Co.

Ash Handling Machinery
Barber-Greene Co.

Asphalt Blocks
Hastings Pavement Co.

Asphalt Plants
Blaw-Knox Co.

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Northwest Engineering Co.

Barges, Concrete and Steel
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Bars, Iron & Steel
Bethlehem Steel Co.
Inland Steel Co.
Jones & Laughlin Steel Corp.
Timken Roller Bearing Co.

Batchers, Adjustable Measuring
Blaw-Knox Co.

Bearings, Ball & Roller
Timken Roller Bearing Co.

Bins, Storage
Blaw-Knox Co.

Bits, Detachable
Timken Roller Bearing Co.

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Inland Steel Co.

Borings, Core
Sprague & Henwood, Inc.

Bridge Operating Machy.
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McKiernan-Terry Corp. (Steele & Condict Div.)

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Bethlehem Steel Co.
Earle Gear & Machine Co.
Mount Vernon Bridge Co.
Phoenix Bridge Co.
Raymond Concrete Pile Co

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Bucyrus-Erie Co.
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Hayward Co.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Sauerman Bros., Inc.
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Buckets, Concrete
Blaw-Knox Co.

Buildings, Steel
Belmont Iron Wks.
Blaw-Knox Co.

Cable Clips
Marion Malleable Iron Wks.

Cableways
American Steel & Wire Co.
Hayward Co.
McKiernan-Terry Corp. (Lambert-Nat'l Hoisting Engine Div.)
Sauerman Bros., Inc
Williamsport Wire Rope Co.

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National Carbide Sales Corp.

Carbide Lights
National Carbide Sales Corp.

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Bethlehem Steel Co.

Castings, Iron & Steel
American Cast Iron Pipe Co.
Bethlehem Steel Co.

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Portland Cement Ass'n

Cement Guns
Cement Gun Company

Cement (Bulk) Handling Equipment
Barber-Greene Co.
Blaw-Knox Co.

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Blaw-Knox Co.

Chemicals
Wallace & Tiernan, Inc.

Chlorinators
Wallace & Tiernan, Inc.

Chlorine, Liquid
Wallace & Tiernan, Inc.

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McKiernan-Terry Corp.
O.K. Clutch & Machry. Co.

Concrete Breaking
McKiernan-Terry Corp. (Steele & Condict Div.)

Concrete Cutting
Concrete Cutting Corp. of America

Concrete Proportioning Equipment
Blaw-Knox Co.

Concrete Reinforcement
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Inland Steel Co.
Jones & Laughlin Steel Corp.

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Raymond Concrete Pile Co.
Spencer, White & Prentis

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Fairbanks, Morse & Co.

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Fairbanks, Morse & Co.
Sauerman Bros., Inc.
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Haiss Mfg. Co., Geo.
Wellman Engineering Co.

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Marion Malleable Iron Wks.

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Bay City Shovels, Inc.
Buckeye Tr. Ditcher Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.
Northwest Engineering Co.

Cranes, Motor Truck
Buckeye Tr. Ditcher Co.

Cranes, Overhead Bridge and Gantry
McKiernan-Terry Corp.
Northwest Engineering Co.

Cranes, Traveling
Wellman Engineering Co.

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(See Searchlight Section)

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McKiernan-Terry Corp. (Lambert-Nat'l Hoisting Eng. Div.)

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Raymond Concrete Pile Co

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(See Excavators, Dragline)

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Hayward Co.
Morris Machine Wks.
Wellman Engineering Co.

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Sprague & Henwood, Inc.

Drills
McKiernan-Terry Corp.

Drills, Diamond
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Spencer, White & Prentis

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Pipe, Wood
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Sauerman Bros., Inc.

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Haiss Mfg. Co., Geo.

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(See Searchlight Section)

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Bay City Shovels, Inc.
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Industrial Brownhoist Corp
Northwest Engineering Co

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Austin-Western Rd. Mchry Co.
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Bucyrus-Erie Co.

Spreaders, Bituminous Surface
Barber-Greene Co.

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(See Forms)

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Cole Mfg. Co., R. D.

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Inland Steel Co.

Steel, Structural
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Bethlehem Steel Co.
Inland Steel Co.
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Towers, Radio and Transmission
Blaw-Knox Co.

Track, Industrial & Portable
Bethlehem Steel Co.
Jones & Laughlin Steel Corp.

Linn Mf.

Tractors, Die
Caterpillar

Traffic Signs & Road Markers
Marion Malleable Iron Wks.

Trailers, Industrial and Portable
(See also Wagons and Trailers)

Tramways
American Steel & Wire Co.
Leschen & Sons Rope Co., A.

Treads, Safety
Blaw-Knox Co.

Trucks, Motor
Linn Mfg. Corp.

Turbines
De Laval Steam Turb. Co.

Underpinning
Spencer, White & Prentis, Inc.

Unloaders, Car and Wagon
Wellman Engineering Co.

Valves
Jenkins Bros.
Smith Mfg. Co., A. P.
Wellman Engineering Co.

Vibrators, Concrete
Electric Tamper & Equip. Co.

Wagons and Trailers, Dump
Austin-Western Rd. Mchry. Co.
Wellman Engineering Co.

Water Purification & Softening
Wallace & Tiernan, Inc.

Welding and Cutting Apparatus
Linde Air Products Co.

Welding, Gas
Linde Air Products Co.

Welding Helmets
American Optical Co.

Welding Rods & Wire
American Steel & Wire Co.
Linde Air Products Co.

Wellpoint Systems
Complete Machry. & Equip Co., Inc.
Moretrench Corp.

Wires & Cables, Electrical
American Steel & Wire Co.

Wood Pipe
National Wood Pipe Co.
Wyckoff & Son Co., A.

...NEERING NEWS-RECORD ADVERTISERS IN THIS ISSUE

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Engineering News-Record* assumes no responsibility for errors or omissions.

	Page
Aetna Casualty & Surety Co.	35
Aldrich Pump Co.	35
American Cast Iron Pipe Co.	14
American Optical Co.	11
American Steel & Wire Co.	16
Atlantic Gulf & Pacific Co.	30
Austin-Western Rd. Mchry. Co.	28
Bailey Meter Co.	32
Barber-Greene Co.	27
Bay City Shovels, Inc.	32
Beebe Bros.	32
Belmont Iron Works	28
Bethlehem Steel Co.	3rd Cover
Blaw-Knox Co.	28, 32
Buckeye Tr. Ditcher Co.	32
Bucyrus-Erie Co.	21, 22
Caterpillar Tractor Co.	2
Cement-Gun Company	30
Cole Mfg. Co., R. D.	28
Complete Machry. & Equip. Co., Inc.	35
Concrete Cutting Corp. of America	35
De Laval Steam Turbine Co.	31
Earle Gear & Machine Co.	28
Electric Tamper & Equip. Co.	30
Ellicott Machine Corp.	30
Eppinger & Russell Co.	28
Fairbanks, Morse & Co.	10
Gunite Construction Co.	30
Haiss Mfg. Co., Geo.	32
Hastings Pavement Co.	9
Hayward Company	32
Industrial Brownhoist Corp.	32
Inland Steel Co.	4
Jenkins Bros.	31
Jones & Laughlin Steel Corp.	30
Lambert National Hoisting Engine Div.	28
Layne & Bowler, Inc.	2nd Cover
Leschen & Sons Rope Co., A.	32
Linde Air Products Company	7
Linn Mfg. Corp.	6
Lock Joint Pipe Co.	5
MacArthur Concrete Pile Corp.	30
Marion Malleable Iron Wks.	30
McKiernan-Terry Corp.	28
Moretrench Corporation	28
Morris Machine Wks.	31
Mount Vernon Bridge Co.	28
National Carbide Sales Corp.	28
National Wood Pipe Co.	31
Northwest Engineering Co.	3
O.K. Clutch & Machry. Co.	32
Pennsylvania Drilling Co.	30
Phoenix Bridge Co.	28
Portland Cement Ass'n	13
Raymond Concrete Pile Co.	30
Sauerman Bros., Inc.	32
Smith Mfg. Co., A. P.	31
Snare Corp., Frederick	28
Spencer, White & Prentis, Inc.	30
Sprague & Henwood, Inc.	30
Steele & Condit Div.	28
Timken Roller Bearing Co.	12
Union Carbide & Carbon Corp.	7
Vulcan Iron Wks.	30
Wallace & Tiernan, Inc.	4th Cover
Wellman Engineering Co.	32
Williamsport Wire Rope Co.	8
Wyckoff & Son Co., A.	31

AN advertising agency recently checked the advertisements in a number of leading business publications and found that 47% of the advertising in *Engineering News-Record* was devoted to new and improved equipment and materials.

Future construction estimates will be planned with an eye open to the economies of these new products. It will pay every engineer and contractor to familiarize himself with the products advertised in this journal before writing specifications or bidding on new projects.

SEARCHLIGHT SECTION

Classified Advertising

Business Opportunities	37
Employment Agency	37
Employment Service	37
Positions Wanted	37
Proposals	35-37
Surveying Instruments (Used)	37
Used and Surplus Equipment	37-39
Wanted to Purchase	37

GENERAL CONTRACTORS EQUIPMENT

Barker, John W.	39
Brooks Co., R. E.	39
Buff	37
Clapp, Riley & Hall Eq. Co.	39
Cleveland Trencher Co.	39
Equipment Corp. of America	39
Foster Co., L. B.	38
Hyman-Michaels Co.	39
Long Island Structural Steel Co.	37
McAllister, M. L.	37
Syracuse Supply Co.	39
United Hoisting Co., Inc.	39
Weil & Co., J. H.	37

PILING

Carnegie Steel Co.	38
Foster Co., L. B.	38
Hyman-Michaels Co.	38
Kalman Steel Corp.	38
Sheet Piling, Inc.	38
Wemlinger, Inc.	38

PIPE

Albert & Davidson Pipe Corp.	38
Albert Pipe Supply Co.	38
Fisher Bros. Steel Corp.	38
Greenpoint Iron & Pipe Co., Inc.	38
Marine Metal & Supply Co.	38

RAILS

Frank. M. K.	38
Hyman-Michaels Co.	38

DIRECTORY OF ENGINEERS 40-41